

COMMERCIAL PRODUCT OPPORTUNITIES

GENERAL DYNAMICS

(EASTERN SYSTEMS CENTER)

INPUT
LIBRARY

ABOUT INPUT

THE COMPANY

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, analysis, INPUT supports in making informed decisions. Services are provided to users of computers, communications products and services.

The company carries out depth research. Working with clients on important issues, members analyze and interpret data, then develop recommendations and innovative ideas to meet their needs. Clients receive reports and access to data on which they can rely for continuous consulting.

Many of INPUT's professionals have nearly 20 years of experience in areas of specialization, such as senior management positions in marketing, or planning. This enables INPUT to supply solutions to complex business problems.

Formed in 1974, INPUT is a leading international consulting firm. Clients include over 100 of the largest and most technically advanced companies.

UNITED STATES, West Coast
2471 East Bayshore Road
Suite 600
Palo Alto, California 94303
(415) 493-1600
Telex 171407

Y-GED /ay
GD2

AUTHOR
Ed Metz

TITLE
Commercial Product Opportunities
12/80.

BORROWER'S NAME

California 90291

Coast

ey 07662

or)

erriwa Street
.S.W. 2072

Italy
Milan 284-2850

JAPAN
INPUT Japan
Suite 1106
7-7-26 Nishi-Shinjuku
Tokyo
Japan 160
(03) 371-3082



COMMERCIAL PRODUCT OPPORTUNITIES

Prepared For:

GENERAL DYNAMICS
(EASTERN DATA SYSTEMS CENTER)

INPUT LIBRARY

DECEMBER 1980



Digitized by the Internet Archive
in 2015

<https://archive.org/details/commercialproduc21unse>

COMMERCIAL PRODUCT OPPORTUNITIES

GENERAL DYNAMICS

(EASTERN DATA SYSTEMS CENTER)

TABLE OF CONTENTS

	<u>Page</u>
I INTRODUCTION	I
A. Project Objectives	I
B. Methodology	I
II EXECUTIVE SUMMARY	5
A. Overview Of Market Opportunities	5
1. Telecommunication-Based Disaster Recovery System	5
2. CAD/CAM Systems And Software	7
3. Computerized Graphics Services	8
4. Dependent Job Control Software	9
5. Machine Time	10
III TELECOMMUNICATION-BASED DISASTER RECOVERY SYSTEM	11
A. Introduction	11
1. Background	11
2. Product Description	12
3. Interview Profile	13
B. Market Characteristics	15
1. Computer Backup Arrangements	15
2. Vendor Profile	19
C. Market/Product Considerations	20
1. Location Of Backup Sites	20
2. Future Plans For Backup Arrangements	20
3. Outside Help In Planning Backup	20
4. Resistance To Disaster Recovery Vendors	21
5. Decision Makers	21
6. Expenditures For Backup Facilities	21
7. Client Profile	22
8. Competition	22
9. Vendors' Expansion Plans	23
10. Future Market Trends	23
D. Market Potential	24
1. Prospects	24
2. Market Pressures	24

	<u>Page</u>
3. Satisfaction With Present Backup Arrangements	25
4. Estimated GD Revenues, Profit And Market Potential	25
E. Recommendations	27
1. Services To Offer	27
2. Advantages And Benefits	28
3. Conclusions	29
IV CAD/CAM SYSTEMS AND SOFTWARE	31
A. Introduction	31
1. Product Description	31
2. Interview Profile	32
B. Market Characteristics	34
1. Product Preference	34
2. Product Satisfaction	34
3. Product Features	34
4. Decision-Making Criteria	38
5. Primary Application Areas	41
6. CAD/CAM Expenditures	41
7. Software Maintenance And System Training	44
8. Competitive Factors	44
C. Market Potential	45
1. Consulting Prospects	45
2. Users' Library	46
3. Future Market Needs	46
4. Future Market Applications	48
5. GD Revenue Expectations, Profits And Market Potential	48
D. Market Development	50
1. Sales Technique	50
2. Competition	51
E. Recommendations	53
F. Conclusions	53
V MACHINE TIME	55
A. Introduction	55
1. Product Description	55
2. Interview Profile	56
B. Market Characteristics	56
C. Market Potential	62
1. Vendors' Present And Future Sales Activity	62
2. Vendors' Perceptions Of Competitive Market Factors	62
3. GD Revenue Expectations, Profit And Market Potential	64
D. Recommendations	68
E. Conclusions	68

	<u>Page</u>
VI COMPUTERIZED GRAPHICS SERVICE	71
A. Introduction	71
1. Product Description	71
2. Interview Profile	71
B. Market Characteristics	73
1. Product Usage	73
2. Drawing Characteristics	74
3. Product Familiarity	76
4. Benefits Perceived By Users	76
5. Service Experience	78
6. Concerns And Objections	78
C. Competition	81
1. Vendor Profile	81
2. Vendor Visibility	81
3. Product Offerings	81
4. Customer Base	81
5. Pricing	83
6. Benefits Perceived By Vendors	83
7. Vendors' Market Expectations	84
D. Market Potential	85
1. Future Drawing Load	85
2. Interest Level	85
3. GD Revenue Expectations, Profits And Market Potential	86
E. Recommendations	87
F. Conclusions	87
VII DEPENDENT JOB CONTROL SOFTWARE	89
A. Introduction	89
1. Product Description	89
2. Interview Profile	89
B. Market Characteristics	90
1. Product Use	90
2. Product Satisfaction	90
3. Competition	92
C. Market Potential	92
1. Product Interest	92
2. Desired Product Features	94
3. Purchase Considerations	94
4. Market Size	95
5. GD Estimated Revenues, Profit And Market Potential	95
D. Recommendations	96
VIII PRODUCT COMPARISON	97
A. Comparison Criteria	97
B. Market Size And Growth	97
C. GD Revenue Opportunity	100

	<u>Page</u>
D. Competition	102
E. Additional Considerations	103
APPENDIX A: INTERVIEW SUMMARY	107
APPENDIX B: TELECOMMUNICATIONS-BASED DISASTER RECOVERY SYSTEM (COMPUTER BACKUP) QUESTIONNAIRE	109
User	109
Vendor	116
APPENDIX C: CAD/CAM QUESTIONNAIRE	119
User	119
Vendor	125
APPENDIX D: MACHINE TIME QUESTIONNAIRE	129
User	129
Vendor	135
APPENDIX E: COMPUTERIZED GRAPHICS SERVICE QUESTIONNAIRE	139
User	139
Vendor	149
APPENDIX F: DEPENDENT JOB CONTROL SOFTWARE QUESTIONNAIRE	155
User	155

COMMERCIAL PRODUCT OPPORTUNITIES

GENERAL DYNAMICS (EASTERN DATA SYSTEMS CENTER)

LIST OF EXHIBITS

		<u>Page</u>
I	-1 Products Reviewed As Potential Market Research Candidates	2
III	-1 User Profile: Disaster Recovery Systems	14
	-2 Vendor Profile: Disaster Recovery Services	16
	-3 End User Critical Applications And Operating Constraints	17
	-4 Backup Arrangements By End User Respondents	18
	-5 Satisfaction With Present Backup Arrangements - Summary Table	26
IV	-1 User Profile: CAD/CAM Systems Or Services	33
	-2 Respondents' Reasons For Purchasing CAD/CAM Systems	35
	-3 User Satisfaction	36
	-4 CAD/CAM Product Appeal	37
	-5 Rating Of CAD/CAM Product Features	39
	-6 Respondents' Primary Applications For CAD/CAM Systems	40
	-7 Rating Of CAD Graphics By Application Area	42
	-8 Respondents' CAD/CAM Expenditures	43
	-9 Comments By Respondents Regarding Product Enhancement	47
V	-1 User Profile: Machine Time	57
	-2 Vendor Profile: Machine Time	58
	-3 Respondents' In-House Systems Configuration	59
	-4 Respondents' Computer Loading Factors	61
	-5 Machine Time Market Potential And Sales Activity, As Stated By Vendors	63
	-6 INPUT's Computer Services Market Forecast (1979-1984)	65
	-7 Utility Processing Services - INPUT's Market Forecast By Industry Sector, 1979-1984	66
VI	-1 User Profile: Computerized Graphics Service	72
	-2 Drawing Characteristics	75
	-3 Benefits Perceived By Users And Potential Users Of Computerized Graphics	77

		<u>Page</u>
	-4 Respondents' Concerns And Objections To A Computerized Graphics System	79
	-5 Respondents' Concerns And Objections To A Computerized Graphics Service	80
	-6 Computerized Graphics Services Offered By Vendor Respondents	82
VII	-1 Respondent Profile: Potential DJC Users	91
	-2 Respondents' Sources Of Job Control Programs	93
VIII	-1 Comparative Market Potential (1981, 1985)	99
	-2 Comparative General Dynamics' Product Revenues	101
	-3 Comparative Product Analysis	104
A	-1 Interview Summary - Eastern Data Center	108

I INTRODUCTION

I INTRODUCTION

A. PROJECT OBJECTIVES

- The objective of this project is to assess the commercial market opportunities for five data processing related products and/or services available from General Dynamics' Eastern Data Systems Center (EDSC) in Norwich, Connecticut.

B. METHODOLOGY

- General Dynamics (GD) and INPUT agreed to examine five data center product/service capabilities to determine their potential for commercialization.
- In preparation, INPUT spent several days with GD/EDSC personnel reviewing a range of potential candidates, as shown in Exhibit I-1.
- After this initial review, INPUT provided GD with comments regarding GD's relative market potential. Criteria used by INPUT in the screening process included:
 - Degree of value added to the product by GD.

EXHIBIT I-1

PRODUCTS REVIEWED AS POTENTIAL MARKET RESEARCH CANDIDATES

CATEGORY	PRODUCT/SERVICE REVIEWED
APPLICATIONS SOFTWARE AND SYSTEMS SOFTWARE	STAR DEPENDENT JOB CONTROL CONTROL OF TSO RESOURCES REGRESSION TESTER FOR NEW IMS RELEASES PANVALET AND COPY INTERFACE WITH IBM DATA DICTIONARY IMS X-REF SYSTEM LEXICON DATA DICTIONARY CONVERSION TO IBM JCL GENERATOR PROBLEM MANAGEMENT SYSTEM CUSTOMER ACCESS OF PRODUCTION FILES THROUGH MARK IV
COMPUTER SERVICES	MACHINE TIME MICROFICHE COMPUTERIZED GRAPHICS
CONSULTING SERVICES	STRUCTURED APPROACH TO SYSTEM DEVELOPMENT COST/BENEFIT ANALYSIS PROJECT MANAGEMENT DATA ENTRY MANAGEMENT PRODUCTION SCHEDULING CAD/CAM TELEPROCESSING NETWORK EXPERTISE LARGE DATA CENTER ACCOUNTING CONTROL MANAGEMENT SCIENCE FACILITIES MANAGEMENT DATA BASE CONSULTING OPERATIONS METHODOLOGY
INSTRUCTIONAL SERVICES	MARK IV COBOL PROGRAMMING FORESIGHT INTRODUCTION TO DATA PROCESSING STRUCTURED DESIGN STRUCTURED PROGRAMMING APPLICATION DUMP READING/LINKAGE EDITOR

- Unique strengths of GD.
 - Product reinforcement of GD corporate strategy.
 - Estimated market size.
 - Anticipated competition.
- After weighing INPUT's comments with other internal considerations, the following items were selected for market research:
 - Telecommunication-based disaster recovery systems.
 - CAD/CAM systems and software.
 - Machine time.
 - Computerized graphics services.
 - Dependent job control software.
 - INPUT then designed questionnaires, selected population samples and conducted field interviews.
 - Fifty interviews were conducted equally across five product areas. Twenty percent of the interviews were conducted on-site; the balance were done by telephone. See Appendix A for a specific breakdown of the interviews by product area.
 - Midway through the interview process, GD was advised of the results being obtained and appropriate adjustments were made where necessary.
 - Research results were presented in St. Louis, Missouri on October 2, 1980.

- A copy of the questionnaires used for the field interviews are shown in Appendices B through F.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. OVERVIEW OF MARKET OPPORTUNITIES

I. TELECOMMUNICATION-BASED DISASTER RECOVERY SYSTEM

- Of the products selected for study, TBDRS offers the best market opportunity for GD because:
 - The market is large, and at the starting point of its growth curve.
 - Competition is light.
 - The market is looking for a more economical and reliable form of computer backup service.
 - GD's annual revenues are conservatively estimated to be \$1.6 million in 1981 and \$9.6 million in 1985. Profits are estimated to be 25% of revenues.
 - Market entry, for a consulting organization, requires a minimum of investment and allows time for GD to plan and organize the resources necessary for additional products and services.

- For these reasons, INPUT recommends that GD make detailed plans for marketing, staffing, training and selling TBDR consulting services and systems within a timeframe that precludes as much competition as possible and enables GD to position itself as a leader in this field.
- A marketing strategy with the following characteristics should be considered:
 - Offer facilities analysis, system planning and design as a consulting service, with options for providing project management in the installation and implementation of the system at one or more client sites.
 - Provide additional consulting in special problem areas both as an option and on a time- and materials-basis.
 - Design standardized "prototypes" of telecommunication-based computer backup systems and market them to appropriate market segments.
 - Develop and sell specialized hardware and software related to the installation and implementation of such computer backup systems.
 - Work closely with the telephone companies and computer mainframe manufacturers in prospecting for leads for such services and systems.
 - Modularize the TBDRS prototypes as much as possible so that there can be some flexibility in marketing.
 - Installation facilities by stages, for minimal disruption.
 - Expand readily as new hardware and facilities come on-line.
 - Dial up to private lines hooked up between client facilities or linked to GD's own network.

- As U.S. presence is recognized and market penetration occurs, sell internationally.
 - Price services, systems and products at a premium, where little or no competition exists.
 - Market selectively to specific, qualified prospects in order to maximize sales effectiveness. Plan to develop more prestigious clients first.
- The field of telecommunication-based computer backup systems is a relatively new field. There is much room for growing and learning for participants in this market. Training and seminars represent opportunities to increase visibility and to promote the product.
 - Each new technological development could present GD with additional market opportunities to broaden market base and capture market share.
 - TBDRS is a product that will enhance GD's image and support GD's reputation as a successful, high-technology aerospace company.

2. CAD/CAM SYSTEMS AND SOFTWARE

- CAD/CAM represents the next best GD revenue potential projected at \$1.1 million in 1981 and \$5.6 million in 1985.
- Even though potential revenue is respectable, this will be a difficult market to develop without giving up GD's proprietary edge in electronic and mechanical design.
- INPUT does not recommend going into the CAD/CAM turnkey systems business, since it is well covered by other companies at this time.
- The only remaining lucrative sector of this market would be in the area of field maintenance. However, the market is aware of the need and other

companies, better positioned than GD as field maintenance organizations, are most likely making plans for market entry.

- If GD decides to enter this sector of the market, INPUT would recommend that it do so, if possible, via remote diagnostics. This technology is rapidly emerging and offers interesting profit opportunities to service organizations equipped with these capabilities.
- On the other hand, GD will have to give serious thought to how this area fits with its market image and how comfortable it would feel in this business.
- If GD would decide to go ahead in this area, an acquisition, if possible, may be best.

3. COMPUTERIZED GRAPHICS SERVICES

- Computerized Graphics Services (CGS), as distinguished from CAD/CAM, constitute a broader market than computer-aided design and machining for manufacturing-type environments.
- Computerized graphics include simplified drafting and graphing applications such as floor plans for buildings and advertising layouts.
- Even though a broader market, CGS shows less revenue potential for GD than CAD/CAM does. This is because of the nature of the service provided. Service, in general, is limited to within 150 miles of the CG service center to maintain quick turnaround time and to handle technical questions that could arise at any stage of production.
- INPUT recommends that GD not go into this market at all, since there is insufficient local market demand to build on.

- CGS is a very labor-intensive business, and the productivity gains brought about with computerization do not work in favor of the service vendor.
- Repeated changes in application for customer assignments are disruptive to overall productivity unless dedicated systems are used to reduce setup charges.
- Pricing margins are more expensive than in-house system costs and, therefore, only work-load overflow needed on short notice is sent out to a service organization. Companies that don't have an in-house CGS use outside service bureaus to test the feasibility of the concept. Once this proven, such companies usually buy their own system.
- Clients are reticent to release proprietary data that represents a part, or most, of the work.
- INPUT believes that GD would not be able to determine or control its own future in this marketplace.

4. DEPENDENT JOB CONTROL SOFTWARE

- The market for dependent job control software is captive, which accounts for some of its limitations.
- Competition is high, given the relative size of the market.
- There appears to be little need for this type of software. This would make the marketing/sales process long and arduous.
- Most companies needing this software either wrote their own programs or bought the next-best version.

5. MACHINE TIME

- The machine time market is very enticing because of the large dollar projections the remote computing services business between 1980 and 1985 - \$3.8 billion and \$9.9 billion respectively.
- However, when a market is this large, competition is extensive. When market segments shrink, as in the case of raw machine time, competition becomes extreme. Profits shrink and, in many cases, become marginal or negative.
- Without value added services in the form of special data bases and applications software to enhance the raw machine time availability, INPUT would recommend that GD not enter this market.
- GD would have to give consideration to the level of system loading, which would probably slow down in-house use or block entry of priority in-house work. Conversely, lowering outside access undermines commercial development. Capital investment in additional hardware may not be feasible.
- Dedicated systems require additional investment, which is weighed against market risks and profitability of the venture.
- Even though GD may wish to establish its business base within a 150-mile radius of Norwich, competition is national, from vendors as far away as the West Coast and Canada.

III TELECOMMUNICATION-BASED DISASTER RECOVERY SYSTEM

III TELECOMMUNICATION-BASED DISASTER RECOVERY SYSTEM

A. INTRODUCTION

I. BACKGROUND

- The concept of a commercial market investigation of a telecommunication-based disaster recovery system is based upon:
 - GD's teleprocessing network expertise as a result of installing its own land and satellite telecommunication system for transfer of data between its own data centers, as shown in Exhibit I-1.
 - GD's desire to make use of its excess computer time (machine time) in its Eastern and other data centers.
 - Findings obtained from the machine time sections of this study (B.1, C.3), which show a large, unsatisfied market demand for a more economically available and reliable computer backup source that could be used for routine processing of work-overload situations or for disaster situations involving part of all of a company's main computer facilities.

2. PRODUCT DESCRIPTION

- A telecommunication-based disaster recovery system provides a company with a land- or satellite-based network of digital telecommunication channels in which critical applications data can be periodically transferred from one computer center to another for processing in times of emergency, planned system maintenance or work-load balancing and scheduling.
- The system would include access to one or more private or shared digital telecommunication lines installed separately from, and independent of, the client's computer facilities in order to minimize the probability of destruction or inoperativeness in times of emergency.
- The cost of private or shared lines would be paid for directly by the customer. GD may opt to establish its own network of shared telecommunication lines separate from, or as an extension of, its current system. Use of these lines by GD's clients could be paid for on an "as-used" basis.
- If GD opted to lease its own lines, INPUT would recommend that GD concentrate its marketing and system implementation efforts within a fixed radius of each GD data center. This would enable GD to limit its initial investment and control the operating costs associated with maintaining these lines.
- As revenue and profit from use of these lines increased, GD could systematically expand this telecommunication network around the original area. This would serve to minimize GD's investment Risks and contribute to GD's orderly development of the market.
- Clients installing this system would have the assurance of prompt, alternate computer backup for critical applications without having to make major capital investments in duplicate computer facilities or shell sites, and without having to incur high monthly payments to disaster recovery service organizations to ensure the availability of compatible and adequate backup.

- Clients would use their own outlying data processing facilities, or those of the vendor or some other third party, as compatible and available backup for data processing of critical applications and termination of the telecommunication-based lines.
- Updated critical data would be transferred frequently and stored at these backup sites for use at appropriate times.

3. INTERVIEW PROFILE

- Ten companies were interviewed in this portion of the survey. Eight were users or potential users of a telecommunication-based system, and two were disaster recovery service vendors.
- All users interviewed represented the central data processing facility for the respondent company, and all such users were within a 150-mile radius of Norwich, Connecticut.
- Fifty percent of the users interviewed said they had some form of computer backup site, even though all of them indicated various degrees of distrust as to whether these facilities were actually capable of supporting their critical applications load within the allotted timeframe and duration required, should they be needed.
- Exhibit III-1 profiles the characteristics of the eight user respondents.
- Three respondents (38%) were either DP vice presidents or directors, three (38%) were DP operations managers, and two (25%) were DP administrative managers.
- One disaster recovery service vendor interviewed was a large national/international subsidiary of a Fortune 500 company, while the other vendor was an expanding branch of a long-established, national DP security storage company.

EXHIBIT III-1

USER PROFILE: DISASTER RECOVERY SYSTEMS

CATEGORY	RESPONDENT							
	1	2	3	4	5	6	7	8
SALES (\$ MILLION)	\$2,332	N/A	N/A	\$396	\$1,640	\$676	N/A	\$753
BUSINESS	ENGINEERING	MANUFACTURING	UTILITY	MANUFACTURING	INSURANCE	UTILITY	BANKING	INSURANCE
LOCATION	WINDSOR, CT	WINDSOR LOCKS, CT	WETHERSFIELD, CT	FOXBORO, MA	SPRINGFIELD, MA	NEW HAVEN, CT	E. HARTFORD, CT	HARTFORD, CT
HARDWARE ENVIRONMENT	IBM 3033 AMD 470 CDC 7600 2 CYBER 130s	IBM 168	IBM 3033 IBM 158	IBM 158	AMD V6 AMD V8 IBM 158	IBM 3033	IBM 3033	IBM 3033
TERMINAL INPUT FROM ALL FACILITIES (NUMBER OF UNITS)	150 RJE WORLDWIDE (400 CRTs)	300	200	160	600	1,000	300	150
LINE SPEEDS	2,400-19,200	HI	—	HI AND LOW	2,400-4,800	—	—	—
FRONT-END CONTROLLER	COMTEN 3705	COMTEN 3705	COMTEN 3705	COMTEN 3705	COMTEN 3705	COMTEN 3705	—	—
ACCESS METHOD	TCAM	TCAM VTAM	—	VTAM BTAM	TCAM	VTAM	VSAM	—
DATALING CONTROL	BISYNC	BISYNC	BISYNC	BISYNC ASYNC	BISYNC	BISYNC	BISYNC	BISYNC
BACKUP SERVICE	HOUSTON CENTER- SAME COMPANY	SUBSIDIARY; MANUAL	NONE	NONE	TP NETWORK SOON	NONE	ANOTHER COMPANY	CO-OP; DASHIELD

- Exhibit III-2 summarizes the operating and services profile of each vendor respondent.

B. MARKET CHARACTERISTICS

I. COMPUTER BACKUP ARRANGEMENTS

- Fifty percent of the respondents indicated that 50% or more of their critical applications were on-line, as shown in Exhibit III-3.
- Sixty-three percent of end users indicated that telecommunication capability was a key constraint on operational recovery, with 120 hours (5 days) being the average maximum downtime before serious damage occurs.
- Payroll, inventory, work scheduling, accounts payable and accounts receivable were the critical application areas most mentioned by respondents.
- One out of eight (13%) user respondents was planning to use teleprocessing (TP) networks as an alternate means of having computer backup in a disaster-type situation.
- Another one of the eight respondents (13%) was currently using an outside disaster recovery service.
- Of the 75% of respondents who indicated that they had "some form" of computer backup system available, 100% indicated that the system was never tested "live," but only under simulated, "dry-run" conditions, as shown in Exhibit III-4.
 - These people thought that their critical applications could resume processing within an average of 40 hours (1.6 days).

EXHIBIT III-2

VENDOR PROFILE:
DISASTER RECOVERY SERVICES

CATEGORY	RESPONDENT	
	1	2
SHELL SITES	5,000 SQ. FT.	NOT YET OPERATIONAL
OPERATIONAL SITES	3,000 SQ. FT.; DIVISIBLE	DO NOT OFFER
TYPE OF COMPUTER	1-IBM 3033 (8 MEG)	-
NUMBER OF CUSTOMERS	80-OPEN 1 YEAR	NOT ESTABLISHED YET
FEE STRUCTURE	\$5,000 PER MONTH \$25,000-50,000 INITIATION CHARGE 4 HOURS FASTEST AVAILABLE TIME \$6,500 PER DAY FOR USE MAY INVOLVE FCC TARRIFFS	-
COMMUNI- CATIONS	4 MODES MAJOR TP CLIENTS - APPARENTLY SATISFIED	UP TO CUSTOMER TO GET DATA TO SITE HAVE 20 DIAL-UP LINES INSTALLED
SOFTWARE CONVERSION	NONE	NONE
CONSULTING	NONE	NONE
DATA STORAGE	NONE, LONG-TERM	LIMITED ON-LINE UNLIMITED OFF-LINE
PEAK LOAD PROCESSING	12-15 CUSTOMERS	-

EXHIBIT III-3

END USER CRITICAL APPLICATIONS AND OPERATING CONSTRAINTS

RE- SPON- DENT NUM- BER	CRITICAL APPLICATIONS	MODE	PERCENT CRITICAL APPLICA- TIONS	MAXIMUM DOWNTIME BEFORE SERIOUS DAMAGE OCCURS	KEY CONSTRAINTS ON RECOVERY		
					CPU	DATA BASE	COM- MUNI- CA- TIONS
1	BILLING PAYROLL PRODUCTION SCHEDULING	BATCH ON-LINE	10% 100	1-21 DAYS 12 HOURS	X	X X	X
2	PAYROLL	BATCH ON-LINE	10 0	1-7 DAYS N/A	X	X	
3	BILLING INVENTORY PAYROLL WORK SCHEDULING RATE SETTING	BATCH ON-LINE	100 0	1-20 DAYS N/A	X	X	
4	PAYROLL ORDER ENTRY INVENTORY	BATCH ON-LINE	10 90	1-8 DAYS 1 DAY	X	X X	X
5	PAYROLL CLAIMS PROCESSING BILLING POLICY ISSUANCE	BATCH ON-LINE	N/A N/A	1-14 DAYS 1-14 DAYS		N/A N/A	X
6	ORDER PROCESSING INVENTORY REPAIR SCHEDULING	BATCH ON-LINE	10 90	N/A 2-3 WEEKS	X		X
7			WON'T SAY				
8	POLICY ISSUANCE	BATCH ON-LINE	50 50	N/A 1 DAY	X	X	X

EXHIBIT III-4

BACKUP ARRANGEMENTS BY END USER RESPONDENTS

RESPON- DENT NUMBER	GUAR- ANTEED BACKUP	TYPE AND FREQUENCY OF TESTING	TIME BEFORE CRITICAL APPLICATIONS COULD RESUME	WOULD EACH CRITICAL APPLICATION RUN NORMALLY?
1	YES	JUST STARTED	12 HOURS	YES
2	YES	YEARLY	24 HOURS	NO
3		NONE		
4	YES	"DRY RUN" ONLY	DON'T KNOW	NO
5	NO	NONE	TWO WEEKS	YES
6	YES	MANUAL BACKUP	2-3 WEEKS	DON'T KNOW
7	YES	"DRY RUN" EVERY 6 MONTHS	2-3 DAYS	DON'T KNOW
8	YES	"DRY RUNS"	2 DAYS TO 6 WEEKS	PROBABLY

- However, only one in four respondents (25%) thought that the critical applications would run normally after the backup system was put into operation.
- Only 25% of respondents performed, or knew how to perform, a risk analysis on their computer backup needs, and one respondent indicated that one of the critical components of a good backup plan was to "keep one's resume up to date."
- Twenty-five percent of the respondents expressed solid interest in satellite telecommunications as a means of interfacing with a backup system.

2. VENDOR PROFILE

- One of the two vendors interviewed indicated that it had no actual experience in a "live" backup situation with any client to date.
- The other vendor would not specify the time it actually took to get a client's critical applications running, or any special problems that arose while doing so.
- One vendor indicated that it guaranteed an environment large enough to backup an IBM 3033-sized application, and that 88% of its customers have made at least one "satisfactory off-line" test to determine whether the backup system would perform if needed.
- One of the vendors indicated that it was actively setting up a disaster recovery planning service to advise end users on the best form of computer backup for their facilities.

C. MARKET/PRODUCT CONSIDERATIONS

I. LOCATION OF BACKUP SITES

- All end users interviewed thought that a computer backup site should be no more than 10 to 100 miles from the original computer site, preferably not in the same telephone exchange or electric power area, if at all possible.
- In this regard, respondents felt that being too close to the original computer site could be as bad as being too far away.

2. FUTURE PLANS FOR BACKUP ARRANGEMENTS

- Respondents stated the following intentions in planning for a computer backup site:
 - Duplicate facilities.
 - Move leased hardware to disaster site.
 - Shell site.
- Two respondents felt that a disaster was necessary to make the problem "real" to their management.

3. OUTSIDE HELP IN PLANNING BACKUP

- All respondents were dependent on computer hardware vendors for information on how to plan backup systems.
- Fifty percent and thirty-eight percent of respondents depended upon seminars and the telephone company respectively for information on planning backup systems.

- One respondent from each group hired an expensive full-time disaster recovery consultant and a disaster recovery planning firm.

4. RESISTANCE TO DISASTER RECOVERY VENDORS

- Almost all respondents expressed one or more serious reservations about using an outside disaster recovery service. The reasons were:
 - Vendor has too many customers in the same region to make their backup feasible.
 - System compatibility problems.
 - Backup site too far away.
 - Services cost too much.
 - DP management believes they can't run their work elsewhere.
 - Don't want to be first on block to use service.

5. DECISION MAKERS

- Over 50% of respondents indicated that the president or some other member of their company's top management (non-data processing) made the decision on the kind of backup systems to use for disaster recovery, and the amount of resources to be budgeted for them.

6. EXPENDITURES FOR BACKUP FACILITIES

- Most respondents were willing to spend, or were actually spending, a minimum of \$200,000 for computer backup in 1979.

- Three of the eight respondents already spent \$2 million: \$2.5 million and \$4 million respectively to set up their own backup site or have one available to them on demand.
- Most respondents indicated that they expected these expenditures to increase significantly in the future to:
 - Upgrade and maintain the system.
 - Implement a telecommunications network into the system.

7. CLIENT PROFILE

- Customers of the two vendors interviewed in the study ranged across 23 states.
- Their mainframes ranged from IBM/148s to multiple installations of IBM/3030s.
- Clients possessed small to large telecommunications networks.

8. COMPETITION

- Vendors expressed the following comments about their competition:
 - "Do nothing" is the biggest competitor.
 - CRL in Chicago.
 - MCAUTO in St. Louis.
 - Martin Marietta's "REBOUND", headquartered in Orlando.
 - NVIP's "SAFE" in Philadelphia.

- DeLaney Associates - disaster recovery planning service.

- American Satellite Corporation (ASC) has announced Quick Reaction Communications (QRC), offering both data link and voice communications through mobile earth stations. QRC is designed to provide backup communications services within 48 hours after the major destruction of existing facilities.
- Sun Information Services offers Sunguard, a fully equipped disaster recovery and backup center for IBM-oriented users, both on a "hands-on" and on an RCS basis.

9. VENDORS' EXPANSION PLANS

- "Open 20 new sites in the next five years."
- "Open three more sites by the end of 1981."

10. FUTURE MARKET TRENDS

- Co-op arrangements on the way out.
- DP will increasingly view backup like insurance - "Nonproductive but necessary."
- Shell sites are good only for a one-site company.
- Distributed data processing will help alleviate pressure on a total company "knock out" (three respondents).
- In a computer backup alternative, there is an unquantifiable element that responds to the emotional comfort of management.

D. MARKET POTENTIAL

I. PROSPECTS

- The number of market prospects for a TBDRS is large and would include:
 - Most Fortune 1,000 companies.
 - Many intermediate- and smaller-sized companies that have critical backup requirements to remain operational and viable.
 - Some federal government and municipal agencies.
 - Certain operations in utilities and large central financial institutions.

2. MARKET PRESSURES

- More and more auditing firms are becoming concerned about the adequacy of backup systems for their clients, as in-house DP facilities become larger and more heavily loaded. These concerns stem from data security, data availability and operational control concerns, as well as corporate compliance and financial tracking purposes.
- The board of directors of these same companies feels that it is being held more and more accountable for overseeing the adequacy of DP controls and support systems in their companies.
- Top management and financial planning committees are becoming increasingly dependent on the information coming out of the computer systems for management control and decision making.

3. SATISFACTION WITH PRESENT BACKUP ARRANGEMENTS

- Sixty-three percent of general and DP management are showing a high concern about the adequacy of current computer backup facilities, as shown in Exhibit III-5.

4. ESTIMATED GD REVENUES, PROFIT AND MARKET POTENTIAL

- It is reasonable to expect that a typical TBDRS consulting job and system implementation program, as outlined in Sections E.1. and A.2., would range in price from \$100,000 to \$500,000. The cost of hardware, software and telecommunication facilities would be extra and billable to the client as part of the project.
- Given the market prospects identified in Section D.1. (estimated at 500 to 1,000 companies), projected market revenues for 1981 would be \$150 million. This is figured by taking the average number of prospects (750) multiplied by the average price per project (\$200,000).
- By 1985, assuming rapid technological development, the cost of installing one of these systems could drop by 50% to an average of \$100,000. This would appreciably expand the market of potential customers to about 5,000 worldwide. Using these statistics, total market potential in 1985 would be \$500 million.
- Expansions, additions and updates to the system, including "live" and "dry run" testing assistance and system maintenance, would generate additional revenue for GD, if desired. One to three years after system installation, these revenues could amount to 25-50% of the original cost of system installation.
- At \$200,000 per average system, GD would probably be able to obtain eight contracts by the end of 1981. This would convert to \$1.6 million in potential GD revenues.

EXHIBIT III-5

SATISFACTION WITH PRESENT BACKUP ARRANGEMENTS - SUMMARY TABLE (ALL END USER RESPONDENTS)

DATA PROCESSING MANAGEMENT		GENERAL MANAGEMENT	
AVERAGE SATISFACTION LEVEL	AWARENESS/ CONCERN	AVERAGE SATISFACTION LEVEL	AWARENESS/ CONCERN
2.5 ON A SCALE OF 1-5*	63% SHOW HIGH CONCERN	2.8 ON A SCALE OF 1-5*	63% SHOW HIGH CONCERN

*1 = HIGHLY DISSATISFIED, 5 = HIGHLY SATISFIED

- Once GD's planned marketing effort took root and technical resources developed, GD's revenues should be able to grow more rapidly. Therefore, INPUT estimates one new contract per month to 1985 as a realistic growth estimate. This would project to \$8.0 million. Another 25% in revenues are possible from maintenance and other post-installation support from 1982 to 1985, which would amount to another \$1.6 million. Total GD revenues for 1985 would then be projected at \$9.6 million.
- Profits before tax are estimated to be 20% of revenues due to low competition, limited investment, controlled operating costs and fee-plus-cost pricing strategy. Consulting fees can be set at a premium because of limited competition, unique expertise and value of the service to large computer installations.
- Based on projected GD revenues, 1981 and 1985 profits are estimated to be \$320,000 and \$1.9 million respectively.

E. RECOMMENDATIONS

I. SERVICES TO OFFER

- INPUT strongly recommends that General Dynamics enter the telecommunication-based computer backup services market, initially as a consulting organization.
- Services should consist of:
 - Facility analysis.
 - System planning.
 - System design.

- As its expertise in this area becomes known, GD would be in an excellent position to implement proposed systems and provide a line of hardware/software products supporting their use.
- This strategy would enable GD to enter the market in a controlled manner, earning revenues while establishing the base for its next level of products and services.

2. ADVANTAGES AND BENEFITS

- The market potential of prospects is large.
- The market is looking for a lower-cost and more reliable alternative to disaster recovery service companies and co-op sharing of data facilities, as backup to their computer systems.
- Telecommunications will continue to be one of the fastest growing segments of the marketplace for a long time to come.
- Telecommunications will continue to be on the leading edge of the information processing industry.
- TBDRS will enable GD to increase its image and stature as a major manufacturer and leader in high-technology products and systems.
- TBDRS would complement and possibly support the Stromberg Carlson and GD communications operations in the company.
- Competition in this specific market area is relatively small.
- Respondents indicated that they don't have adequate time or expertise to investigate or plan computer backup arrangements thoroughly.

- Respondents, in general, welcome a third-party organization that can communicate with top management about the needs for, and advantages of, a computer backup system, and can take full responsibility for its planning and implementation.
- GD could conceivably offer a variety of these services to disaster recovery service companies and their clients to develop their interface with these backup facilities more effectively.
- GD will have to work closely with large telecommunication companies and mainframe manufacturers as part of implementing these systems. These organizations can act as strong sources of sales leads for new clients and subcontract business, thus alleviating the need, at least initially, for an extensive sales organization.
- The timing is good now for movement into this market.

3. CONCLUSIONS

- INPUT recommends that GD act promptly, committing adequate resources to planning and solidly establishing itself in these markets.

IV CAD/CAM SYSTEMS AND SOFTWARE

IV CAD/CAM SYSTEMS AND SOFTWARE

A. INTRODUCTION

I. PRODUCT DESCRIPTION

- A CAD/CAM system or service offers computer-aided design and computer-aided manufacturing techniques to design and manufacturing engineers as a powerful means of increasing productivity.
- Based on its existing resources, GD would be able to provide special and custom applications software and CAD/CAM services to:
 - Aerospace and defense system contractors.
 - Electronics manufacturers.
 - Oil and gas companies.
 - Shipbuilders.
 - Automobile manufacturers.
 - Mass transportation designers and contractors.

- Utilities.
- Metal fabricators.
- In addition to the software development and capital investment savings, companies purchasing special and custom applications software and services from General Dynamics would have the added advantage of doing so from an experienced end user.

2. INTERVIEW PROFILE

- Nineteen companies were contacted in this portion of the survey. Sixteen were users or potential users of CAD/CAM systems and services; three were vendors.
- Ten companies were subsequently interviewed - seven users and three vendors.
- Of the nonvendor companies contacted but not interviewed, three companies were not using any form of CAD/CAM system or service; one was forming a task force to investigate this area; one would not participate in the interview; and four were on plant shutdown or vacation.
- Exhibit IV-1 profiles the characteristics of the seven users interviewed.
- All user respondents were located within a 150-mile radius of Norwich, Connecticut.
- Seventy-one percent of the user respondents were using CAD, but not CAM, systems. One respondent (14%) was using both CAD and CAM, and one respondent was using CAM but not CAD.
- Of the three vendors interviewed, one was:
 - A large, international CAD system vendor.

EXHIBIT IV-1

USER PROFILE: CAD/CAM SYSTEMS OR SERVICES

CATEGORY	RESPONDENT						
	1	2	3	4	5	6	7
SALES (\$ MILLION)	\$750	\$2,332	\$380	\$551	\$11	\$63,897	\$193
INDUSTRY	MANU- FACTURER	MANU- FACTURER	MANU- FACTURER	MANU- FACTURER	MANU- FACTURER	PETRO- LEUM	CONSULTING ENGINEERS
LOCATION	NEW BRITAIN, CT	WINDSOR, CT	WESTBORO, MA	HICKSVILLE, NY	HAUPPAUGE, NY	NEW YORK, NY	NEW YORK, NY
USING CAD	NO	YES	YES	YES	YES	YES	YES
USING CAM	YES	NO	YES	NO	NO	NO	NO
PRIMARILY CAD/CAM SYSTEM	STRUTHERS DUNN	CALMA	CALMA	CALMA	CALMA	AUTOTROL	COMPUTER- VISION

- A CAM equipment manufacturer.
- A smaller, national, specialty market CAD system vendor.

B. MARKET CHARACTERISTICS

I. PRODUCT PREFERENCE

- Exhibit IV-2 indicates that respondents were most sensitive to a vendor's special applications expertise as the primary reason for choosing their CAD/CAM system.
- Price and larger data base storage capability were secondary and tertiary factors respectively.

2. PRODUCT SATISFACTION

- All respondents indicated satisfaction with the general or special applications software available with their CAD/CAM system.
- There was less satisfaction with accompanying hardware and the lack of timely, competent field service and maintenance. Forty-three percent indicated some measure of dissatisfaction in these areas, as shown in Exhibit IV-3 and IV-4.

3. PRODUCT FEATURES

- Seventy-one percent of the respondents were pleased with the performance and range of applications capabilities of the software components in their CAD/CAM system.

EXHIBIT IV-2

RESPONDENTS' REASONS FOR PURCHASING CAD/CAM SYSTEMS

RESPONDENT NUMBER	REASON(s)
1	PRICE SPECIAL APPLICATIONS COMPETENCE
2	MORE FLEXIBLE APPLICATIONS SOFTWARE LARGER DATA BASE STORAGE CAPABILITY
3	PRICE
4	BEST IC DESIGN PACKAGE ON THE MARKET CLOSE PROXIMITY TO VENDOR FOR SERVICE
5	BEST ELECTRONIC DESIGN SYSTEM ON THE MARKET
6	BEST SOFTWARE FOR APPLICATION
7	WANTED SYSTEM COMPATIBILITY WITH OTHER SYSTEMS IN COMPANY

EXHIBIT IV-3

USER SATISFACTION

RESPONDENT	IS PRODUCT SATISFACTORY?	REASON(s)
1	NOT ENTIRELY	TOO COSTLY LONG DELIVERY TIMES
2	DEBATABLE	TROUBLESOME HARD- WARE - CRTs, MEMORY, PLOTTERS, PENS
3	PRODUCT-YES SERVICE-NO	POOR FIELD SERVICE ON HARDWARE
4	YES	HAVE 98% UPTIME; RUN SYSTEM THREE SHIFTS, 7 DAYS/WEEK; EXCELLENT THIRD-PARTY MAINTENANCE
5	YES	BEST SPECIAL APPLI- CATIONS COLOR SYSTEM ON THE MARKET
6	YES	DOES A GOOD JOB
7	YES	GOOD SOFTWARE; NO MAJOR MECHANICAL PROBLEMS

EXHIBIT IV-4

CAD/CAM PRODUCT APPEAL

RESPONDENT NUMBER	FEATURES LIKED BEST	FEATURES LIKED LEAST
1	DOES THE JOB	ACCESS DIFFICULT BE- CAUSE OF MACHINE LAN- GUAGE PROGRAMMING
2	GOOD AT WRITING CUSTOM PROGRAMS	PARTS, REPAIR, SERVICE ANYTHING NOT MANU- FACTURED/PROVIDED DIRECTLY BY VENDOR
3	WIDE RANGE OF COM- MAND STRUCTURE FOR VARIOUS FUNCTIONS	NOT ENOUGH STORAGE CAPABILITY
4	STRONG SOFTWARE OVERALL SYSTEM PRODUCTIVITY	POOR SERVICE TROUBLE MODIFYING STANDARD SOFTWARE
5	GREAT SOFTWARE	WEAK DESIGN RULES CHECKING PROGRAMS
6	FAST TURNAROUND TIME ACCURACY	SLOW WET-INK PLOTTERS POOR RESOLUTION ON ELECTROSTATIC PLOTTERS
7	GENERAL DRAFTING AND DESIGN	TOO LONG TO DO VERY DENSE DRAWINGS

- In general, respondents were once again disappointed in the hardware components of their CAD/CAM system - from poor repair service to badly designed and operating parts, slow speeds and poor resolution of CRTs and plotters.
- User respondents rated the following product features (in order of importance) when evaluating their CAD/CAM systems, as shown in Exhibit IV-5.
 - State-of-the-art technology.
 - Ability to model/design with the system.
 - Ability to develop a parts library.
 - On-line interaction.
 - Industry acceptance.
- Respondents' comments regarding product enhancement are shown in Exhibit IV-6.

4. DECISION-MAKING CRITERIA

- Interviewed users stressed the following criteria as most important in choosing a CAD/CAM vendor, in order of priority:
 - Knowledge of applications area.
 - System reliability.
 - System service track record.
 - Reputation of vendor.

EXHIBIT IV-5

RATING OF CAD/CAM PRODUCT FEATURES
(FREQUENCY OF MENTION BY RESPONDENTS)

POINT SCORE	PRODUCT FEATURES										INTEGRA- TION WITH OTHER PRODUCTS
	MODEL- ING	ON- LINE	IN- HOUSE	THROUGH SERVICE BUREAU	PARTS LIBRARY	HUMAN INTER- ACTION	STATE- OF-ART TECH- NOLOGY	INDUSTRY ACCEPT- ANCE	ACADEMIC SUPPORT		
5	4	3	2	1	3	1	7	3	1	2	
4	0	3	3	0	0	5	0	1	0	3	
3	2	1	1	0	1	1	0	2	2	2	
2	1	0	0	2	1	0	0	0	2	0	
1	0	0	0	2	1	0	0	1	2	0	
0	0	0	0	1	0	0	0	0	0	0	
N/A	0	0	1	1	1	0	0	0	0	0	
TOTAL NUMBER OF RESPON- DENTS	7	7	7	7	7	7	7	7	7	7	

SCALE: 1 = UNIMPORTANT, 5 = EXTREMELY IMPORTANT

EXHIBIT IV-6

RESPONDENTS' PRIMARY APPLICATIONS
FOR CAD/CAM SYSTEMS

RESPONDENT NUMBER	PRIMARY APPLICATION(s)	
	CAD	CAM
1	-	PRINTING, CALIBRATION AND LETTERING OF TAPE MEASURES
2	ELECTRICAL SCHEMATICS STRUCTURAL STEEL DESIGN FACILITIES DESIGN	-
3	PRINTED CIRCUITRY	PRINTED CIRCUITRY
4	ELECTRONIC CIRCUIT DESIGN	-
5	INTEGRATED CIRCUITS DESIGN APPROXIMATELY 12,000 GATES PRINTED CIRCUITS	-
6	FORMS DESIGN PRESENTATION VISUALS GRAPHIC ARTS FOR ADVERTISING	-
7	PIPING LAYOUT MECHANICAL DESIGN	-

- The administrative levels for making a purchase decision for CAD/CAM systems varied greatly among the user respondents - from graphics design group manager to the chairman of the board for financial authorization. Technical authorization ranged from director of design engineering to the vice president of engineering.

5. PRIMARY APPLICATION AREAS

- Respondents indicated heaviest use of CAD systems in electrical and micro-electronic circuit design, as shown in Exhibits IV-6 and IV-7.
- Architectural and mechanical engineering design applications appeared to be heavy secondary and tertiary areas of application, as shown in Exhibit IV-7.
- Five out of seven respondents (71%) indicated that they had developed or purchased CAD systems software capable of designing LSI/VLSI circuits exceeding 250,000 gates.
 - Respondents indicated that Hewlett-Packard, Bendix, Hampshire Engineering, CGA, DEC and SCI-CARDS (in Buffalo, New York) were some of the companies in the process of developing, or now selling, commercial versions of such LSI/VLSI circuit design software.

6. CAD/CAM EXPENDITURES

- In general, respondents indicated that their future expenditures for CAD/CAM systems would increase moderately in 1980 and 1981, as shown in Exhibit IV-8.
- Present company hardware and software expenditures per year ranged from \$100,000 (departmental level) to \$3,500,000 (corporate level).

EXHIBIT IV-7
RATING OF CAD GRAPHICS BY APPLICATION AREA
(FREQUENCY OF MENTION BY RESPONDENTS)

POINT SCORE	APPLICATION AREA					
	ELECTRONIC CIRCUIT DESIGN	MANU- FACTURING PLANT DESIGN	MATERIAL FLOW DIAGRAMS	CON- STRUCTION SITE PLANS	PRODUCT DESIGN PLANS	PERSONNEL TRAINING
5	5	1	1	1	0	1
4	0	1	2	3	1	3
3	0	1	1	1	4	1
2	0	2	1	0	1	2
1	1	1	2	1	1	0
N/A	1	1	0	1	0	0
TOTAL NUMBER OF RESPONDENTS	7	7	7	7	7	7

SCALE: 1 = UNIMPORTANT, 5 = EXTREMELY IMPORTANT

EXHIBIT IV-8

RESPONDENTS' CAD/CAM EXPENDITURES

RESPONDENT NUMBER	CAD/CAM EXPENDITURES		
	1979	1980	1981
1	_____	— DON'T KNOW —	_____
2	\$150,000 - HARD- WARE AND SOFTWARE	\$200,000 HARD- WARE AND SOFTWARE	-
3	\$300,000 - INCLUDING IN-HOUSE DATA BASE BASE DEVELOPMENT	\$3,500,000 INCLUDING DATA BASE	-
4	\$200,000 HARD- WARE AND SOFTWARE	\$100,000	\$600,000
5	\$20,000 - SYSTEM UPGRADE	\$325,000 SYSTEM	-
6	\$100,000 - DEPART- MENT BUDGET ONLY	\$50,000	HIGHER THAN 1980
7	\$100,000 ENTIRE COMPANY	\$1,000,000 ENTIRE COMPANY	HIGHER THAN 1980

7. SOFTWARE MAINTENANCE AND SYSTEM TRAINING

- When rating CAD/CAM vendors' software maintenance and system training, users of CAD/CAM systems rated periodic visitation to clients' sites and periodic software enhancement as the two most important facets of vendors' performance.
- Most respondents indicated that an average of two person weeks were needed to train an individual in the mechanical operation of a CAD/CAM system, and that an average of four to six person months were required to make that individual proficient in the use of the system, depending on the application area.

8. COMPETITIVE FACTORS

- Both respondent vendors stated that they considered software development and application knowledge the two most critical factors necessary to compete in the marketplace today.
- Both vendors interviewed provided consulting and programming support to their CAD/CAM customers, representing up to 5% of their total yearly revenues.
- Both turnkey system vendors indicated that very few of their customers needed or actually did much custom programming or applications software development for their CAD/CAM systems, since the standard packages on the market today are usually more than adequate for their needs.

C. MARKET POTENTIAL

I. CONSULTING PROSPECTS

- Fifty-eight percent (four out of seven) of the respondents indicated that they might be interested in working with a third-party outside consulting organization to help program and apply CAD/CAM techniques more effectively to their manufacturing and design operations. However, two of these four stated that they were concerned that the consultant's fees would be too high priced to make a working relationship feasible.
- One respondent felt that a system integrator rather than a consulting approach would be better accepted by his company.
- The respondents who indicated that they were not interested in outside consultants said so because they thought they had better expertise for their applications in-house.
- Three out of six respondents indicated that they would like to retain an outside hardware consultant to help them better implement and apply their CAD/CAM capabilities within their manufacturing and production operations. These same respondents also wanted to retain a reliable third-party maintenance organization for their CAD/CAM equipment, since none was readily available in their area of the country.
- The other three respondents indicated that they did not need any outside help in implementing CAD/CAM within their organization.
- Both vendors felt that they did not need outside applications development help because this was the basis upon which their company was built - they probably had a wider range of in-depth expertise in-house than any outside consultant could provide.

2. USERS' LIBRARY

- Four out of six respondents (67%) indicated that they would not be interested in accessing a CAD/CAM users' library of applications software on a co-op or paying basis because:
 - Companies need custom-tailored programs.
 - Their company has a policy of not sharing its proprietary software.
 - Their company is more advanced in software development than most other companies and they want to retain this competitive advantage.
- The other two respondents who were interested in a users' library felt that magnetic tape was the most practical way of sharing library programs. However, both expressed concern about data format compatibility problems.
- Two of the four respondents indicated that they would rather buy programs than share them, so as not to have to reciprocate in sharing their own programs with other members of the users' library.

3. FUTURE MARKET NEEDS

- As expected, most CAD/CAM users' desires for product enhancements consisted of hardware-oriented developments such as faster machine response times, CRT color output and larger on-line storage capabilities to develop more extensive data bases, as shown in Exhibit IV-9.
- However, on the software side, users expressed interest in more levels of operating software and artificial intelligence systems. The latter would consist of a computer that automatically accessed a standard parts and components library after an engineer's specification was read into the system. The output from this stage of processing would then interact with an extensive rules library governing valid parts operation and continuity checks. The

EXHIBIT IV-9

COMMENTS BY RESPONDENTS REGARDING PRODUCT ENHANCEMENT

RESPONDENT NUMBER	COMMENTS
1	"WANT A MORE SOPHISTICATED DEC SYSTEM." "ON-THE-SHELF, DUPLICATE, BACKUP HARDWARE."
2	"LARGER DISK DRIVES."
3	"MORE USER-ORIENTED SYSTEM." "BETTER TRAINING PROGRAMS TO REACH PROFICIENCY LEVEL FASTER."
4	"MOVE <u>LEVELS</u> OF SOFTWARE." "LARGER CRTs, FASTER SCREEN REFRESHING, COLOR."
5	"AUTOMATIC LAYOUTS - ENGINEER INPUTS SPECI- FICTION; COMPUTER AUTOMATICALLY PROVIDES FINAL SCHEMATIC."
6	"COLOR CRT."
7	"FASTER DENSE DRAWINGS."

computer would then automatically generate a schematic diagram for the specified product.

- All users indicated that they did not need any new application programs since existing vendors covered these areas quite adequately.

4. FUTURE MARKET APPLICATIONS

- Three user respondents (43%) saw the majority of CAD/CAM systems interfacing with large in-house mainframe computers in the next two to five years for purposes of extracting data from the large data bases resident on these systems. This information would be fed into the CAD module or would be the feedback (output) loop from a CAD/CAM system. Such data would be transmitted to the large mainframe for permanent data storage and use in future design applications.
- One respondent saw less user interaction with CAD systems in the future, given the advent of more sophisticated software in batch mode, which would automatically produce schematics after the design specifications had been set up.
- One respondent indicated that it was purchasing a standard CAD software interface program for its IBM 370 for about \$25,000 from a Boston-based firm named DRAGON.
- Vendors stated that they saw group technology and mechanical design and layout applications for machine tools as the future applications for CAD/CAM in the next five years.

5. GD REVENUE EXPECTATIONS, PROFITS AND MARKET POTENTIAL

- The value of CAD/CAM systems installed in the U.S. in 1979 is estimated to be \$275 million.*

*Merrill Lynch Research Division

- Sales of these systems is expected to increase to \$1.5 billion by 1984.*
- If we assume that the cost of software related to these CAD/CAM systems represents 20% of total system sales, and that the market growth rate is 42% per year over this period, the 1981 and 1985 total market potential for CAD/CAM software would be \$111 million and \$426 million respectively.
- At a \$425,000 average cost per system in 1981, the average cost of software related to a CAD/CAM system in 1981 can be calculated at approximately \$90,000 per system.
- Vendors responding to this INPUT study were careful to state that no one knows for sure the total number of CAD/CAM systems installed to date because an appreciable number have been developed in-house without direct vendor participation.
- However, all vendors agree that there is a big market for add-on system hardware, including more workstations, larger disk drives, memories and terminals.
- Special applications software designed by General Dynamics for these systems could realistically be expected to sell for \$90,000 per package, depending on the extent of capability of the software and the application area involved.
- In 1979, an estimated 38% of CAD/CAM systems were being used for mechanical applications and 28% for electronic (IC and PCB) design applications.*
- Since 1970, there have been approximately 2,500 standalone CAD/CAM systems installed worldwide, with an additional 610 installed in 1979. Total worldwide installations for 1981 are estimated to be 6,270 units (42% growth per year).
- Assumptions for General Dynamics sales expectations are:

*Merrill Lynch Research Division

- Design and sell CAD/CAM applications software only for mechanical and electronic design applications.
 - Average selling price of GD software package would be \$90,000.
 - One in 100 close rate given market penetration expectations and existing vendor market saturation.
 - Sales over a five-year period.
 - Sales only to 6,270 existing installations.
- Given the above assumptions, General Dynamics' five-year software sales expectations, given their expected share of the market, would be: \$5,670,000 (63 installations sold over five years x \$90,000 per package) spread over a five-year period, for an average of \$1,134,000 per year.
 - The above revenues do not take into consideration expected new system installations in 1981-1985. Revenues are expected to grow at the compound rate of 42% over this period.
 - Profits are not expected to exceed 10% of revenues, because of intense market competition. On that basis, profits for 1981 and 1985 are projected to be \$113,000 and \$567,000 respectively.

D. MARKET DEVELOPMENT

I. SALES TECHNIQUE

- The majority of respondents indicated that the best way to sell a CAD/CAM applications program would be through a demonstration to prospective clients to show that the software could actually do what the vendor claimed it could do.

- This could be done by arranging seminars and workshops through appropriate trade associations and user groups.
- The selling and demonstrations should be done by sales engineers and technical/product support people working closely together.
- Most respondents indicated that the cost savings, especially when making additions and alterations to existing schematics and drawings, was the most important product benefit, which should be stressed throughout the selling process.
- One respondent felt that a nonpressure-type sales environment using video tape cassettes through a well-planned direct mail program would optimize the sales process. Interested parties could then be called by telephone and later contacted in person as a means of following up on more serious prospects.
- Vendors stated that the most difficult aspect of selling CAD/CAM systems and software is trying to convince decision makers that their system will actually do what the manufacturer says it will do in their specific application environment.

2. COMPETITION

- The bulk of the sellers' market is composed of approximately seven well-positioned vendors, half of which excel in a specific application area. For instance, Computervision excels in mechanical applications while CALMA excels in electronic circuit design.
- As a result, the available market is well covered by these vendors.
- Vendors indicated that they did not view computer mainframe manufacturers as competition.
- Vendors see themselves as selling turnkey systems.

- The price of their systems range from \$200,000 to \$800,000, depending on the number of workstations and software applications programs made available to the client.
- 1979 revenues of respondent vendors ranged from \$29.5 - 30 million to \$131,000,000. They expect 1980 revenues of \$45 - 202 million respectively.
- Vendors indicated that their client base ranged from Fortune 50 companies through organizations with \$25-30 million in sales, to two-man organizations.
- Approximately 10% of their client base was Fortune 1,000 companies.
- Progressiveness of management thinking and return on investment are the primary reasons why most companies purchase CAD/CAM systems.
- Vendors indicated that their customers used their CAD/CAM systems for a wide variety of applications, including:
 - Mapping.
 - Petrochemical plant piping layout and design.
 - Electronic circuitry design (PC and IC, HVAC).
 - Air conditioning and heating system design.
 - Numerical control.
 - Plant and office layout and design.
 - Mechanical product design.
 - General architectural engineering.

- Vendors indicated that clients liked their special applications expertise and data base management capability best.
- The same vendors stated that clients most dislike the inadequacy of their field service and maintenance operations, the slowness of the computers that they install in their turnkey systems and the lack of adequate on-line data storage capability.
- Vendors mentioned Computervision and Applicon as their biggest competitors.

E. RECOMMENDATIONS

- INPUT recommends that GD not enter the CAD/CAM software or systems market, for the reasons mentioned below in Section F.

F. CONCLUSIONS

- The CAD/CAM market is not software-application bound, but quite hardware-performance bound.
- No respondents indicated any additional need for applications software programs.
- CAD/CAM system vendors are firmly established in the marketplace and well positioned for longer-term growth.
- The "available" market of CAD/CAM users has been penetrated, and many of these companies have committed themselves to building on these or in-house systems for the next three to four years.

- The major area of market demand for CAD/CAM services is in the area of equipment maintenance and repair. INPUT seriously doubts whether General Dynamics is structured or oriented toward going into this type of business.
- There is a large gap in the development and implementation of state-of-the-art CAM programs and systems that interface or are integrated with the latest CAD programs and techniques. This gap is caused by a combination of complex factors, many of which are beyond vendor control:
 - The condition of the U.S. manufacturing industry today.
 - The lack of adequate government incentives for mass retooling and capital equipment investment.
 - A long tradition of slowly changing manufacturing methods and ideologies for manufacturing plant layout and design.
- INPUT has serious reservations about GD's ability to compete in the area of CAD/CAM systems and applications software without giving up a good part of its competitive edge in design and manufacturing techniques currently used in its aerospace and defense systems operations.
- Shorter-term, higher-yielding commercial information processing opportunities exist today for which GD is aptly suited.

V MACHINE TIME

V MACHINE TIME

A. INTRODUCTION

I. PRODUCT DESCRIPTION

- For the purposes of this study, computer machine time is defined as the commercial availability of a computer system for timeshared or remote batch operation without access to any special applications programs or data bases.
- Based upon the Eastern Data Center's capacity levels, and the utilization rates of its Univac 1108 and IBM 3033 computers, such a service was investigated for its market potential within a 150-mile radius of Norwich, Connecticut.
- Clients using this service would receive the benefit of immediate or pre-scheduled access to the latest generation of computer equipment and software available in the market today. The system would be available on a round-the-clock basis to efficiently handle a user's data processing needs. The inherent benefits would be that clients would not have to incur the major expense associated with leasing or purchasing their own systems; would not be responsible for maintenance, and would not have the overhead associated with finding and employing full-time operating personnel.

2. INTERVIEW PROFILE

- Ten companies were interviewed in this portion of the study: eight were actual or potential users of this kind of service, while two were vendors.
- All user respondents were large- or intermediate-sized companies or institutions. Exhibit V-1 profiles the characteristics of these companies.
- Batch vendors were national batch and remote computing services companies with data processing headquarters in Connecticut, and with a business base also heavily distributed in this same metropolitan area. Exhibit V-2 profiles the size and operating characteristics of these vendors.

B. MARKET CHARACTERISTICS

- Exhibit V-3 outlines respondents' in-house computer configuration. The following characteristics of these facilities are significant:
 - Sixty-three percent of the respondents stated that they had installed one or more IBM 3030 series computers within the last two years.
 - Sixty-three percent stated that they were planning to further increase their in-house computer capacity in 1980 or 1981.
 - Only 38% indicated that they were using some form of in-house batch processing at this time.
 - All respondents indicated that they were using on-line processing in-house from 30-80% of the time.
 - Only 38% of the respondents indicated that they had established and were operating an in-house data base management system.

EXHIBIT V-1

USER PROFILE: MACHINE TIME

CATEGORY	RESPONDENT							
	1	2	3	4	5	6	7	8
SALES (\$ MILLION)	N/A	N/A	\$554	N/A	\$960	\$450	N/A	N/A
INDUSTRY	INSURANCE	MANU-FACTURING	MANU-FACTURING	FINANCE	HOSPITAL	INSURANCE	BANK	UTILITY
LOCATION	HARTFORD, CT	WORCESTER, MA	WORCESTER, MA	WATERBURY, CT	WORCESTER, MA	HARTFORD, CT	EAST HARTFORD, CT	NEW HAVEN, CT
TITLE OF PERSON INTERVIEWED	V.P., DATA PROCESSING	DIRECTOR, SYSTEM PLANNING	MANAGER, TECHNICAL SERVICE	MANAGER, DATA PROCESSING	MANAGER, COMPUTER OPERATIONS	DIRECTOR, DATA PROCESSING	ADMIN-ISTRATIVE OFFICER	DIVISION MANAGER, COMPUTER OPERATIONS

EXHIBIT V-2

VENDOR PROFILE: MACHINE TIME

CATEGORY	RESPONDENT	
	1	2
TYPE OF SERVICES OFFERED	100% BATCH	95% BATCH AND REMOTE BATCH, 5% ON-LINE
CPU	IBM 360/65 IBM 370/4301	IBM/145
SOFTWARE SUPPORT	DOS	DOS SOON - OS, VSI
FEE STRUCTURE	\$85 PER HOUR	\$150 PER HOUR
STANDARD FEE SCHEDULE	YES	YES
DISCOUNTS TO LARGE USERS	YES - DEPENDING ON VOLUME	YES - NEGOTIATED

EXHIBIT V-3

RESPONDENTS' IN-HOUSE SYSTEMS CONFIGURATION

CATEGORY	RESPONDENT							
	1*	2*	3*	4*	5	6*	7	8
CPU	IBM/158 ITEL/A55	IBM/50 IBM/148 IBM/158	IBM/158 IBM/3031	IBM/3033	IBM/158	IBM/3033	IBM/3033	IBM/3033
NUMBER OF TERMINALS	150	230	250	100	82	150	300	1,000
FRONT-END CONTROLLER	NONE	NONE	NONE	NONE	NONE	NONE	NONE	3705
ACCESS METHOD	CICS	BTAM CICS CMS	VTAM	VSAM BTAM	VTAM	-	VSAM	VTAM
DATALINK CONTROL	-	BISYNC	ASYN	-	BISYNC	BISYNC	BISYNC	BISYNC
O.S. SYSTEM SOFTWARE	VS-1 (CICS) VM (CMS)	DOS OS VM	MVS	OS DOS	DOS CICS VSE	MVS	MVS JES-2	MVS
DBMS	NONE	NONE	IMS	CULLINANE	NONE	NONE	NONE	IMS CICS TOTAL INTERCOMM
OTHER SOFTWARE	NONE	SYNCSORT	TIME- SHARING	NONE	SYNCSORT	SYNCSORT PANVALET UCC-1	SYNCSORT CICS TSO	SYNCSORT UCC-6
OPERATING ENVIRONMENT	30% ON-LINE	70% ON-LINE	80% ON-LINE	ON-LINE	50% ON-LINE	50% BATCH 50% ON-LINE	70% BATCH 30% ON-LINE	50% BATCH 50% ON-LINE

* PLAN TO INCREASE COMPUTER CAPACITY SIGNIFICANTLY IN 1980 AND 1981

- Only one respondent out of the eight (13%) indicated that it had a "front-end" controller installed and operating for data communication.
- There was an average of 282 terminals installed per respondent interviewed in the study.
- As shown in Exhibit V-4, user respondents indicated that the average computer loading for all applications over three operating shifts was currently 51% of existing capacity, with no single shift exceeding 64% of capacity.
- Eighty-eight percent of the respondents indicated that they had not used machine time from an outside service bureau within the last year, and did not expect a change in this policy for the next 12 months.
- However, 25% of the respondents indicated that they would consider using an outside remote computing service in the next year as a disaster recovery backup system, if needed.
- Seventy-five percent of the respondents stated that their company never supplied machine time to another organization. Those that did, only did so as a favor to a local firm that had a temporary problem with its computer center operations.
- Eighty-eight percent of respondents did not expect these patterns to change in the next 12 months.
- Steps respondents are taking to increase CPU efficiency and balance loadings include:
 - Offloading batch from prime time.
 - Initiating capacity planning (which will take one and one-half years to implement).

EXHIBIT V-4

RESPONDENTS' COMPUTER LOADING FACTORS

RESPON- DENT NUMBER	FIRST SHIFT MIDNIGHT - 8 A.M.		SECOND SHIFT 8 A.M. - 4 P.M.		THIRD SHIFT 4 P.M. - MIDNIGHT		AVERAGE LOADING ALL SHIFTS
	NOW	FUTURE	NOW	FUTURE	NOW	FUTURE	
1	-	-	90%	INCREASING	45%	STABLE	70%
2	-	-	100	HIGH INCREASE	-	-	30
3	-	-	75	-	50	-	60
4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	65%	INCREASING	35	-	35	-	50
6	60	-	30	-	30	-	40
7	50	-	50	-	75	-	60
8	80	-	40	-	40	-	50
AVERAGE	64%	-	60%	-	46%	-	51%

- Using IBM "USAGE" package.
- However, this is difficult to do with increasing teleprocessing applications.

C. MARKET POTENTIAL

1. VENDORS' PRESENT AND FUTURE SALES ACTIVITY

- Exhibit V-5 shows that respondent vendors indicated that sales of raw computer time have been flat throughout 1979 and 1980. They do not see any increase in market demand for the balance of 1980 and into 1981.
- Vendors indicated that it is increasingly difficult to retain market share by selling machine time alone. As a result, they are considering more aggressive sales and marketing techniques to increase market penetration.
- Vendors indicated that certain service bureau-type applications were increasing as a result of the slump in the U.S. economy; e.g., direct mail advertising using computer-generated mailing lists.
- Value added applications that companies did not or could not develop in-house were on the increase. However, this meant some form of time and monetary investment on behalf of the vendor, which the latter was reticent to make because of insufficient market research to determine market risk and sales potential.

2. VENDORS' PERCEPTIONS OF COMPETITIVE MARKET FACTORS

- Both vendors indicated that they had little or no competition from other remote computing vendors.

EXHIBIT V-5

MACHINE TIME MARKET POTENTIAL AND
SALES ACTIVITY, AS STATED BY VENDORS

CATEGORY	VENDOR	
	1	2
MARKET AREA	BOSTON	HARTFORD
MARKET DEMAND	ADDING NATIONAL ACCOUNTS - FOR VALUE ADDED SERVICES	NO INCREASE SEEN
SALES ACTIVITY 1979	RAW TIME - SAME AS LAST YEAR	RAW TIME - SALES LEVEL AT BEST
1980-1981	DIRECT MAIL MARKETING PROGRAMS FOR CLIENT COMPANIES GROWING VERY QUICKLY	WILL NEED AGGRESSIVE MARKETING/SALES EFFORT TO RETAIN MARKET SHARE

- One vendor indicated that decreasing mainframe and minicomputer prices, both on new equipment and especially on used equipment, was a significant factor in reducing its market share.
- Both vendors felt that the growth in special applications software programs, data bases and other value added services was also a significant factor eroding their raw machine time revenues.
- Neither vendor thought that the economic recession was a factor in reducing business revenues.

3. GD REVENUE EXPECTATIONS, PROFIT AND MARKET POTENTIAL

- INPUT forecasts that the remote computing services (RCS) market will be \$8.2 billion in 1984, and that the batch processing services market will be \$3.5 billion for the same period, as shown in Exhibit V-6. At an annual average growth rate of 21%, 1985 market projections would be \$9.9 billion and \$4.2 billion respectively.
- Approximately 25% of these revenues will come from the utility services segment, which includes raw machine time. This converts the above 1985 statistics for RCS and batch services to \$2.5 billion and \$1.0 billion respectively.
- Utility processing services continue to grow most rapidly in the government sectors (federal, state and local governments), as shown in Exhibit V-7. Providing such services to government requires highly specialized marketing and sales knowledge. Assuming GD concentrates its marketing in this sector, total market revenues can be expected to reach \$608 million and \$1.3 billion in 1981 and 1985 respectively.
- Assuming GD initially markets in a three-state area (Connecticut, Massachusetts and New York representing 6% of total U.S. market share), market potential could be \$36 million and \$78 million in 1981 and 1985 respectively.

EXHIBIT V-6

INPUT'S COMPUTER SERVICES MARKET FORECAST
(1979-1984*)

COMPUTER SERVICE		USER EXPENDITURES								
MODE	TYPE	1978 (\$M)	1979 (\$M)	GROWTH 1978- 1979 (%)	1980 (\$M)	1981 (\$M)	1982 (\$M)	1983 (\$M)	1984 (\$M)	AAGR 1979- 1984 (%)
REMOTE COMPUTING SERVICES	GEN. BUS.	\$ 390	\$ 480	21%	\$ 580	\$ 690	\$ 840	\$ 1,000	\$ 1,190	20%
	SCI. & ENG.	300	340	13	390	460	540	630	730	16
	IND. SPEC.	1,320	1,610	22	1,980	2,410	2,950	3,610	4,410	22
	UTILITY	640	760	18	900	1,090	1,310	1,550	1,840	20
SUBTOTAL		\$2,650	\$3,190	20%	\$3,850	\$4,650	\$5,640	\$ 6,790	\$ 8,170	21%
FACILITIES MANAGE- MENT	GEN. BUS.	-	-	-	-	-	-	-	-	-
	SCI. & ENG.	100	110	6	120	130	140	150	160	8
	IND. SPEC.	840	960	15	1,110	1,270	1,470	1,680	1,920	15
	UTILITY	210	250	18	280	330	390	450	520	16
SUBTOTAL		\$1,150	\$1,320	15%	\$1,510	\$1,730	\$2,000	\$ 2,280	\$ 2,600	15%
BATCH	GEN. BUS.	690	750	9	840	950	1,060	1,200	1,360	13
	SCI. & ENG.	90	100	3	100	100	100	100	100	0
	IND. SPEC.	1,060	1,150	9	1,290	1,390	1,490	1,570	1,660	8
	UTILITY	350	370	7	380	390	400	400	410	2
SUBTOTAL		\$2,190	\$2,370	9%	\$2,610	\$2,830	\$ 3,050	\$ 3,270	\$ 3,530	8%
TOTAL PROCES- SING	GEN. BUS.	1,080	1,230	13	1,420	1,640	1,900	2,200	2,550	16
	SCI. & ENG.	490	550	10	610	690	780	880	990	13
	IND. SPEC.	3,220	3,720	16	4,380	5,070	5,910	6,860	7,990	16
	UTILITY	1,200	1,380	15	1,560	1,810	2,100	2,400	2,770	15
SUBTOTAL		\$ 5,990	\$ 6,880	15%	\$7,970	\$9,210	\$10,690	\$12,340	\$14,300	16%
SOFTWARE PRODUCTS	SYSTEM	\$ 760	\$ 980	29%	\$1,280	\$1,680	\$ 2,210	\$ 2,950	\$ 3,950	32%
	APPLI- CATION	590	720	23	890	1,100	1,370	1,720	2,160	24
SUBTOTAL		\$ 1,350	\$1,700	26%	\$2,170	\$2,780	\$ 3,580	\$ 4,670	\$ 6,110	29%
PROFESSIONAL SERVICES		1,370	1,620	18	1,920	2,270	2,700	3,200	3,800	19
GRAND TOTAL		\$ 8,710	\$10,200	17%	\$12,060	\$14,260	\$16,970	\$20,210	\$24,210	19%

* USER EXPENDITURES ARE ROUNDED TO NEAREST \$10 MILLION

SOURCE: MAS ANNUAL REPORT, 1979

EXHIBIT V-7

UTILITY PROCESSING SERVICES -

INPUT'S MARKET FORECAST BY INDUSTRY SECTOR, 1979-1984

INDUSTRY SECTOR	MARKET FORECAST BY INDUSTRY SECTOR, 1979-1984								
	1978 (\$M)	1979 (\$M)	GROWTH 1978- 1979 (%)	1980 (\$M)	1981 (\$M)	1982 (\$M)	1983 (\$M)	1984 (\$M)	AAGR 1979- 1984 (%)
DISCRETE MANUFACTURING	\$ 140	\$ 159	14%	\$ 181	\$ 207	\$ 233	\$ 264	\$ 303	14%
PROCESS MANUFACTURING	119	136	14	150	163	194	222	252	13
TRANSPORTATION	29	34	17	39	44	49	54	59	12
UTILITIES	94	107	14	119	132	145	157	170	10
BANKING AND FINANCE	46	51	13	58	65	73	82	95	13
INSURANCE	27	30	11	32	35	39	42	46	11
MEDICAL	12	14	17	15	17	19	21	24	11
EDUCATION	24	27	11	29	31	32	33	34	5
RETAIL	50	56	12	62	68	77	86	98	12
WHOLESALE	101	112	11	120	129	136	143	150	6
FEDERAL GOVERNMENT	362	427	18	503	608	730	880	1,050	20
STATE & LOCAL GOVERNMENT	78	86	10	97	117	137	156	177	16
SERVICES	49	59	20	71	86	103	121	143	19
OTHER	65	76	17	89	105	122	143	166	17
TOTAL	\$1,196	\$1,374	15%	\$1,565	\$1,807	\$2,089	\$2,404	\$2,767	15%

SOURCE: MAS ANNUAL REPORT, 1979

- Since this is a very competitive market with well-established national and local vendors, INPUT estimates that GD's market share could be 0.4% (1 in 250, or \$144,000) in 1981, increasing to 1.0% (1 in 100, or \$780,000) in 1985.
- The relatively low rate of growth in utility services is due largely to a decline in the sale of raw time, which offsets the rapid growth of more sophisticated problem-solving services.
- Graphics - such as MCAUTO's new VIVIDATA package allowing production of bar charts, graphs, pie charts, etc., from computer output - are an increasing part of the utility processing market.
- Vendors indicated that they are giving greater attention to the problem of disaster recovery when looking at market potential for raw computing services. This is an area in which Sun Information Services and Shared Medical Systems have introduced services.
- The number of national and local RCS and batch computer services companies operating within a 150-mile radius of Norwich, Connecticut (which includes Boston and New York) is quite large. For this and other reasons, profits are not expected to exceed 10% of GD's revenue. Profits are calculated to be \$14,000 and \$78,000 in 1981 and 1985 respectively.
- In addition, such trends as User Site Hardware Services (USHS), whereby the RCS vendor places intelligent hardware (i.e., terminals, microcomputers, minicomputers) at the user's site or at the vendor's site dedicated to the user, will continue to make major inroads into the utility processing services market.
- INPUT estimates that USHS will grow at an average annual rate of 68% between now and 1984.
- Even though USHS in the utility services portion of the RCS market represents an alternate method of delivering services, it will also require a considerable

investment by service vendors that would want to establish themselves in this market.

D. RECOMMENDATIONS

- INPUT recommends that General Dynamics not enter the raw machine time market for the reasons stated below in Section E.

E. CONCLUSIONS

- System configuration profiles indicate very strongly that:
 - Users have adequate in-house data processing capacity, given their recent new mainframe acquisitions and continued plans for increased purchasing in the next two years.
 - More and more companies are increasing their in-house, on-line system capabilities, thereby reducing demand for outside service bureaus.
- The declining costs of purchasing/leasing computer mainframes and their increased computing power are causing more and more companies to install their own in-house systems.
- In addition to the commercial cost factors, it is usually not technically feasible for companies to split their in-house, on-line applications with an outside vendor, especially if their application programs are to any degree proprietary.
- Value added services vendors are increasing their penetration of the marketplace at the expense of raw machine time vendors.

- There also appears to be a definite trend by companies with large mainframe computers to sell their excess capacity to some of the smaller companies in their area. This creates a two-tier market for RCS.
- Projected GD revenues and profits are small, given the very competitive market environment and lack of value added applications software or data bases.

VI COMPUTERIZED GRAPHICS SERVICE

VI COMPUTERIZED GRAPHICS SERVICE

A. INTRODUCTION

1. PRODUCT DESCRIPTION

- A computerized graphics service offers computer-aided design and graphics capabilities both to companies that have not made an investment in their own graphics system and to companies that have made this investment but have periodic demands for outside help to meet rapid turnaround times, special applications or abnormally high work loads.
- One facet of a computerized graphics service is computer-aided design (CAD). A computerized graphics service encompasses a wide range of applications, including graphic arts for advertising, printing and publishing.

2. INTERVIEW PROFILE

- INPUT contacted 28 companies within 150 miles of Norwich, Connecticut, that appeared likely either to have their own computerized graphics systems in-house, or to use an outside computerized graphics service.
- Ten of these companies (seven users and three vendors) were subsequently interviewed. Exhibit VI-1 presents a profile of the respondents.

EXHIBIT VI-1
USER PROFILE:
COMPUTERIZED GRAPHICS SERVICE

CATEGORY	RESPONDENT						
	1	2	3	4	5	6	7
SALES (\$ MILLION)	\$25	\$676	N/A	N/A	525	750	16
INDUSTRY	CONSTRUC- TION ENGINEERS	UTILITY	CONSTRUC- TION ENGINEERS	CONSTRUC- TION ENGINEERS	UTILITY	MANUFAC- TURING	ENGINEER- ING
LOCATION	NEW YORK, NY	NEW HAVEN, CT	NEW YORK, NY	NEW YORK, NY	BERLIN, CT	NEW BRITAIN, CT	PROVIDENCE, RI
NUMBER OF DESIGN ENGINEERS AND DRAFTSMEN EMPLOYED	400	13	400	1,200	45	20	5
DRAWINGS PER MONTH	DON'T KNOW	200	200	400	25	45	15
COMPUTER- IZED GRAPHICS	NONE	NONE	NONE	IN-HOUSE SYSTEM	NONE	NONE	NONE

- Of the six vendors of computerized graphics (CG) services identified within 150 miles of Norwich, three had gone out of business within the last 12 months. Existing vendors of CG services could not be found any closer to Norwich, Connecticut, than northern New Jersey.
- The remaining 15 users or potential users of computerized graphics services were not interviewed for the following reasons:
 - The appropriate respondent was on vacation.
 - The respondent would not cooperate in the survey.
 - The respondent had to get clearance from the company's legal or corporate communications department to do the interview.

B. MARKET CHARACTERISTICS

I. PRODUCT USAGE

- Six out of the seven user respondents (86%) did not have a computerized graphics system in-house, nor did they use an outside service for this work. All of their work was done manually.
- All respondents employed an average of 147 design engineers and draftsmen companywide to produce an average of 97 drawings per month.
- All respondents indicated that the number of design engineers and draftsmen in their company did not fluctuate by more than 20% in the last 12 months. Two of these respondents indicated that the number of design engineers and draftsmen in their companies would grow.

- Eighty-six percent of respondents stated that their drawings were not input to some other system or process.
- Only one respondent stated that a record of his drawings was noted in a master computer file, but the drawing itself was not digitized.
- One respondent stated that his company was currently using a Xerox computer in its St. Louis headquarters, which had pertinent graphics, design and engineering software purchased from McAuto. Installed in 1974, this system was operating on-line from each satellite office one year later.
 - This same respondent thought that their company's Boston office had used some outside service in the past 12 months, but didn't know the vendor's name.
- Two respondents stated that they had installed a computerized graphics system in-house seven years ago. One of these turnkey systems, purchased for \$100,000 from a company called Dimension Systems, consisted of a mini-computer and Lockheed software. Use of the system was discontinued because of hardware/software problems and difficulty in its use. The other system, a dedicated Xerox system with McDonnell Douglas software for plant and office design, was sold when the company got out of that business.

2. DRAWING CHARACTERISTICS

- Exhibit VI-2 shows that 71% of user respondents stated that their drawings often had the following characteristics:
 - Drawn very close to scale.
 - Frequent modifications made to existing drawings.
 - Require much hand lettering.

EXHIBIT VI-2

DRAWING CHARACTERISTICS

CHARACTERISTICS	PERCENT RESPONDING AFFIRMATIVELY		
	OFTEN	SOMETIMES	NEVER
DRAWN VERY CLOSE TO SCALE	71%	29%	0
INCLUDE STANDARD COMPONENTS	29	57	14
VERY COMPLEX	57	43	0
MODIFACTIONS TO EXISTING DRAWINGS	71	29	0
REQUIRE MUCH HAND LETTERING	71	29	0
INCORPORATE U.S. MILITARY STANDARDS	14	29	57
PRODUCED IN THREE DIMENSIONS	14	29	57

3. PRODUCT FAMILIARITY

- Four out of seven respondents (57%) stated that they were familiar with computerized graphics systems, and an equal number stated that they had considered using such a system in the past.
 - Respondents indicated that they had seen these systems demonstrated at trade shows and seminars, primarily.
 - Their major consideration for using such a system would be productivity gains.
 - Respondents stated, however, that they did not go on to buy a system or use an outside service because they had sufficient or excess personnel in-house.

4. BENEFITS PERCEIVED BY USERS

- Forty-three percent of the respondents stated that the most important benefit of computerized graphics was to speed the turnaround time of their drawings (productivity at any cost), as shown in Exhibit VI-3.
- The majority of the respondents (86%) did not regard high-quality drawings at lower cost (optimized productivity) as the strongest benefit of computerized graphics.
- Only 14% of the respondents felt that computerized graphics reduced shortages of design personnel.
- One respondent stated that standardization of drawings would be one of the benefits of computerized graphics, while two respondents felt that a computerized machine could not produce accurate and esthetically appealing drawings that would be acceptable to their clients.

EXHIBIT VI-3

BENEFITS PERCEIVED BY USERS AND POTENTIAL USERS OF COMPUTERIZED GRAPHICS

RATING	PERCENT RESPONDING AFFIRMATIVELY			
	IMPROVES PRODUCTIVITY	SPEEDS TURNAROUND TIME	PROVIDES HIGH- QUALITY DRAWINGS AT LOWER COST	REDUCES SHORTAGE OF DESIGN PERSONNEL
1	29%	43%	14%	14%
2	29	43	29	-
3	43	14	29	14
4	-	-	29	71

SCALE: 1 = MOST IMPORTANT, 4 = LEAST IMPORTANT

5. SERVICE EXPERIENCE

- The one respondent who had experience in using an outside computer graphics service stated that it did so on an experimental basis and that this experience convinced the firm that:
 - Computer graphics were feasible.
 - A system should be purchased for in-house use to lower their cost per drawing.

6. CONCERNS AND OBJECTIONS

- Exhibits VI-4 and VI-5 list respondents' concerns and objections to computerized graphics systems and services.
- One vendor indicated that the biggest problem in marketing computerized graphics services was the market's resistance to change. Older people don't want to be re-educated in using new machines and techniques, so the sales thrust is to progressive top management.
- Another vendor indicated that there was not enough product/service advertising to increase market awareness.
- Vendors' strongest complaints from customers were that too much front-end education and training was required of them before they could use computerized graphics services or systems.
- Vendors indicated that the biggest "nagging" problem between vendors of computerized graphics services and clients was that clients failed to explain enough of what they required or desired as part of a final drawing.

EXHIBIT VI-4

RESPONDENTS' CONCERNS AND OBJECTIONS TO A COMPUTERIZED GRAPHICS SYSTEM

RESPONDENT NUMBER	COMMENTS
1	"Waiting to get on the system (scheduling) uses up any time savings gained by computerization."
2	"Implementation and system purchase price is very high."
3	"Mistakes are noticed by working directly with hard copy, on the board."
4	"From a control of proprietary information standpoint, it would be better done in-house."
5	"I work for a conservative company; concept is too progressive for us."
6	"Too expensive of a front-end investment without a government subsidy."
7	"Front-end cost too expensive."

EXHIBIT VI-5

RESPONDENTS' CONCERNS AND OBJECTIONS TO A COMPUTERIZED GRAPHICS SERVICE

RESPONDENT NUMBER	COMMENTS
1	"Not practical; if minor changes have to be made, it becomes a hassle; lose control of project."
2	"May be less expensive to go outside and eliminate the entire drafting department."
3	"No objection, may be a good idea."
4	"Don't know how good an idea this is because they have not tried a service before."
5	"Cost too high."
6	"If company wanted to go the computer graphics route, they would probably start with a service to gain experience before making major investment."
7	"Company wants convenience and security of an in-house system."

C. COMPETITION

1. VENDOR PROFILE

- The three vendor respondents had been in business for three and one-half, four and seven years respectively.
- All three vendors interviewed were local or regional in market activity and felt that 150 miles was the critical radius to provide adequate service to their client base.

2. VENDOR VISIBILITY

- Only one respondent indicated that he had been contacted by an outside computer graphics service (Gerber Scientific).
- Most respondents either did not know, or had never heard, of any service companies in their area.

3. PRODUCT OFFERINGS

- Exhibit VI-6 profiles the type of services offered by respondent vendors.

4. CUSTOMER BASE

- All three vendors stated that architectural and engineering firms were a prime source of business for their computerized graphics services, software and systems.
- However, all three also stated that their client base spanned the full spectrum of the market - from one-person, \$2 million companies to large, Fortune 50 companies.

EXHIBIT VI-6

COMPUTERIZED GRAPHICS SERVICES OFFERED BY VENDOR RESPONDENTS

RESPONDENT NUMBER	TYPE OF SERVICE
1	<ul style="list-style-type: none"> ● COMPUTERIZED GRAPHICS SERVICES <ul style="list-style-type: none"> - APPLICATION AREAS <ul style="list-style-type: none"> . CONSTRUCTION . ELECTRICAL ENGINEERING . MARINE ARCHITECTURE . CHEMICAL PROCESS DESIGN . SITE PLANNING . TOPOGRAPHIC MAPS . PHOTOGRAPHIC MASKS FOR PC BOARDS
2	<ul style="list-style-type: none"> ● SOFTWARE PACKAGE/TURNKEY SYSTEMS <ul style="list-style-type: none"> - APPLICATION AREAS <ul style="list-style-type: none"> . ENGINEERING MODELS TO DESCRIBE VARIOUS STRUCTURES . FINITE ELEMENT ANALYSIS . GEOMETRIC DRAWINGS . DEFORMATION, STRESS DIAGRAMS
3	<ul style="list-style-type: none"> ● DRAFTING SERVICE BUREAU <ul style="list-style-type: none"> - ALL APPLICATIONS

- Their customer bases ranged from 40 to 100 accounts.

5. PRICING

- All respondents priced their service on a time-and-materials basis, with the exception of software and system products, which were priced as a package.
- The range of annual billing per account for each vendor was:
 - Respondent 1 - \$2,400 to \$360,000.
 - Respondent 2 - \$20,000 to \$82,000.
 - Respondent 3 - \$135 to \$250,000.

6. BENEFITS PERCEIVED BY VENDORS

- Vendors stated that the advantages of the services they provide to their clients are:
 - Better-quality work.
 - Lower cost (economy).
 - Ability to perform tasks that cannot be done in-house by client.
 - More efficient (faster turnaround).
- Two of the three vendors interviewed did not believe that they had much competition. One firm saw its competition as engineering services.
- Two of the three vendors did regard in-house systems as their major indirect competition.

7. VENDORS' MARKET EXPECTATIONS

- One vendor stated that his 1979 revenues from computer graphics services were \$1 million. The second vendor's revenues were \$50,000 (six to seven customers), and the third vendor was not willing to say.
- Two vendors expected a 20-50% increase in 1980; the third vendor saw no increase in business over this period.
- None of the vendors saw any major increase in business over the next five years.
- The largest vendor (\$1 million in revenues per year) saw his company becoming more of a systems house - keeping the service component for "bread and butter" business.
- Vendors mentioned their desire for greater labor force productivity and the shortage of drafting graduates ("people want to be engineers") as the primary forces contributing to their five-year growth expectations.
- Process engineering, manufacturing, aerospace and defense industries presented the greatest areas for growth in the next five years, according to the vendors interviewed.
- None of the vendors interviewed knew of a computerized graphics service in New York City, Connecticut or Boston.
- Vendors commented that the South would be the best place to sell a CG service because companies there have come to realize that they cannot find the people they need.
- One vendor sees a general increase in both market supply and demand in the next five years, since prices of systems and services are expected to drop.

- Another vendor sees a new market demand via remote computing from the customer's site to a vendor's mainframe, although all the technology has not been worked out yet.

D. MARKET POTENTIAL

I. FUTURE DRAWING LOAD

- Forty-three percent of the respondents indicated that they expected their drawing load to increase from 5% to 100% in the next 12 months due to an increase in the number of new contracts and projects in their company.
- Projecting over the next 12 months, 29% of the respondents said they expected their drawing load to stay level, and another 29% said they expected theirs to decrease.

2. INTEREST LEVEL

- Five out of seven respondents (71%) stated that their company had little or no interest in computerized graphics.
- Two of these five respondents stated that CG would only be considered if their workload drastically increased. Another respondent registered satisfaction with the manual drawings since "that system worked" and was dependable.
- Two out of seven respondents (29%) stated that their company was very interested in computerized graphics because their company was progressive, had seen the benefits of computerization, and wanted to increase productivity without increasing the labor force.

- Most respondents, even if they were not using a system or service at this time, felt that the concept of computerized graphics would not "go away," but felt that the market demand would be increasing sometime in the future.
3. GD REVENUE EXPECTATIONS, PROFITS AND MARKET POTENTIAL
- The following averages were obtained from information provided by the CG vendors or users interviewed in this part of the study.
 - Number of accounts - 70.
 - Number of years in business - 4.8 years.
 - Annual revenue per account (median) - \$50,000.
 - One out of seven respondents used an outside computer graphics service within the last five years.
 - INPUT estimates that there are approximately 500 companies within 150 miles of Norwich that are prospects for an in-house CG system in 1981, and that one in ten will use an outside CG service.
 - INPUT further estimates that the number of prospects for CG systems and services will double by 1985.
 - Using the above statistics as assumptions, INPUT estimates that the total market potential in 1981 for CG services is \$2.5 million, and \$5.0 million for 1985.
 - Assuming GD obtains 15 accounts per year (70 accounts per vendor divided by 4.8 average years in business), then GD's 1981 expected revenues would be \$750,000, and 1985 expected revenues would be \$3.75 million.

- Profits are estimated at 10% of revenue, giving GD profits of \$75,000 in 1981 and \$375,000 in 1985.

E. RECOMMENDATIONS

- INPUT recommends that General Dynamics' Eastern Data Center not market computerized graphics services for the reasons given below in the conclusions section of this chapter.

F. CONCLUSIONS

- Potential users of computerized graphics services are very concerned about releasing proprietary designs and plans to outside service bureaus that cannot or will not guarantee security for the work they handle. This is a major reason why the service business component of the CG market has not grown larger.
- When computerized graphics users increase their use and reliance on outside services, there comes a point where economy will dictate purchasing an in-house system. The service vendor, therefore, either gets business from companies that are trying computerized graphics on an experimental basis, or works overload business from companies that have in-house systems. Both forms of "stop-gap" business are not conducive to short- or long-term growth.
- Since the serviceable market of potential clients is within a 150-mile radius of Norwich, Connecticut, the total market potential in terms of dollar revenues over the next five years is relatively small compared to other commercial market opportunities that General Dynamics could take advantage of in the information processing industry.

- Very optimistically, INPUT believes that General Dynamics' gross revenues from computerized graphics services would not exceed an average of \$2.5 million for the next five years, excluding marketing costs and associated overhead.
- The CGS market is quite price sensitive. The break-even point for purchasing and operating an in-house system is relatively low when one considers tax credits, depreciation rates and equipment obsolescence.

VII DEPENDENT JOB CONTROL SOFTWARE

VII DEPENDENT JOB CONTROL SOFTWARE

A. INTRODUCTION

I. PRODUCT DESCRIPTION

- Dependent Job Control (DJC) software, renamed Dependent Run Control (DRC), is a proprietary, batch, job control program developed by General Dynamics' EDS for its Univac 1108 computer.
- In summary, the program defines to the system the network of jobs to be run in series or in parallel with each other, initiates and checks the readiness of each file to be used and reports to the operator which job is in process, on hold or completed in the network or job queue.
- Specifically, the program defines the relationship between a predecessor and a successor run. The program provides a much more efficient processing environment by encouraging parallel processing and employing net-to-net releases.

2. INTERVIEW PROFILE

- Thirteen companies were identified within a 150-mile radius of Norwich, Connecticut, that had a Univac 1100 Series computer operating in-house.

- Nine of these companies were interviewed in this part of the survey.
- Exhibit VII-1 profiles the size and characteristics of these user respondents.
- One company was interviewed as a prospective vendor of some form of DJC program. This interview was conducted with Sperry Univac's Software/Systems Group in Blue Bell, Pennsylvania, and its regional support groups in other parts of the country.

B. MARKET CHARACTERISTICS

1. PRODUCT USE

- Seven out of nine respondents (78%) stated that they were using some form of a dependent job control program on their Univac system.
- Two of the nine respondents had used this software for over eight years. One respondent was in the process of updating its software. Only two respondents were not using any program of this nature.

2. PRODUCT SATISFACTION

- One hundred percent of the respondents using some form of a dependent job control program indicated that they were satisfied with their program because:
 - It did the job it was designed to do.
 - It was flexible and efficient.
 - It was easy to use.

EXHIBIT VII-1

RESPONDENT PROFILE: POTENTIAL DJC USERS

CATEGORY	RESPONDENT								
	1	2	3	4	5	6	7	8	9
SALES (\$ MILLION)	\$1,098	\$180	\$6,260	\$3,679	\$3,231	N/A	\$85	\$6,663	N/A
INDUSTRY	COM- MUNI- CATIONS	MANU- FAC- TURING	MANU- FAC- TURING	INSUR- ANCE	MANU- FAC- TURING	STATE GOVERN- MENT	MANU- FAC- TURING	MANU- FAC- TURING	BANK- ING
COMPUTER MAIN- FRAME	U1100/44	U1100/81	U1100/81	U1100/80 U1100/90	U1100/80	U1100/21	U1100/10	U1100/80	U1100/10

3. COMPETITION

- Five of the nine respondents (56%) obtained their form of DJC software from Sperry Univac, as shown in Exhibit VII-2.
- Interviews with Sperry Univac's Software/Systems Groups in Blue Bell, Pennsylvania; Clearlake, Iowa; and Roosevelt, Minnesota, revealed that Univac's Computer Users Group (USE) formerly known as Univac Program Library Interchange (UPLI) had a form of automatic job control program available to Univac computer owners only.
- The January 1979 ICP Software Directory lists one computer operations and scheduling software system available for purchase and use in a Univac JCL operating environment. The program is called Scheduling Systems and is sold by Value Computing, Inc., in Cherry Hill, New Jersey, for \$32,000.
- The October 1979 ICP Software Directory shows two more computer operations and scheduling software programs available for purchase with Univac mainframes and minis. These programs sell for \$3,500 and \$900 respectively.
- None of the above ICP-listed programs has the same features as General Dynamics' DJC program, and none has parallel run processing capability from network job configurations accessing common data bases.

C. MARKET POTENTIAL

I. PRODUCT INTEREST

- Of the two respondents who did not have a dependent job control program, one was interested and indicated that his company would be writing its own program within the next 12 months.

EXHIBIT VII-2

RESPONDENTS' SOURCES OF JOB CONTROL PROGRAMS

RESPONDENT NUMBER	OUTSIDE SOFTWARE VENDOR	DEVELOPED IN- HOUSE	OTHER
1	VALUE COMPUTING	-	-
2	DOESN'T HAVE A PROGRAM		
3	DOESN'T HAVE A PROGRAM		
4	-	-	UNIVAC
5	-	X	-
6	-	-	UNIVAC
7	-	-	UNIVAC
8	-	-	UNIVAC
9	-	-	UNIVAC

- This respondent indicated that the benefit of such a program would be efficiency: the company would be able to run 42 jobs in parallel for each of its seven subsidiary companies accessing common data bases.
- This respondent indicated that it would be willing to pay from \$5,000-10,000 for such a program, which would be equivalent to the cost of one person month of in-house programming.

2. DESIRED PRODUCT FEATURES

- Only two of the seven respondents (29%) who had some form of dependent job control program stated that they would like to have enhanced features on their program.
 - One respondent wanted automatic step and procedure balancing; the other, complete data file sharing.

3. PURCHASE CONSIDERATIONS

- All respondents indicated one or more of the following considerations when evaluating the purchase of a dependent job control program:
 - Ease of use.
 - Ease of maintenance.
 - Ease of modification.
 - Ease of adaptability.
 - Would have to be much better than manufacturer's software, which comes with the system.

4. MARKET SIZE

- The following summarizes respondents' comments on how large a market they think exists for a dependent job control program.
 - "Many companies do not tightly schedule their jobs to require sophisticated DJC software."
 - "Many companies do not have their program flow diagrams documented to be easily able to implement a sophisticated job control program."
 - "Maybe 50% of Univac 1100 users."
 - "Would sell best in commercial rather than scientific/engineering environments. Univac 1100 series is not a business machine, per se. Therefore a program developed for such a machine, by definition, would have limited use" (two respondents).
 - "Very small, based on talks with other users" (two respondents).
 - "If users want software improvements, users will most likely do it themselves and Univac would provide them with programming code."
 - "Five years ago Univac developed this feature in their software."
 - "New Univac users, unfamiliar with Univac software, could have an interest."
- Four out of nine respondents (44%) could not estimate what the market size for this type of software could possibly be.

5. GD ESTIMATED REVENUES, PROFIT AND MARKET POTENTIAL

- As of January 1, 1980, there were 483 Univac 1100 Series computers (all models) installed and operating in the U.S., with another 207 units on order for

delivery in the U.S. and abroad. This gives a total of 690 potential customers in 1981 for the DJC program, assuming no user had more than one Univac 1100 Series computer and no user was using any version of a sophisticated job control program on its system. 1985 projections of new Univac 1100 installations are not expected to increase by more than 50 units per year giving a total of approximately 1,090 installations by 1985.

- Making a very optimistic assumption that 25% of present and future Univac 1100 installations would purchase General Dynamics' DRC program at \$15,000 over a five-year period, the total gross revenues to General Dynamics in 1985 would not exceed \$4,125,000, indicating an average of \$825,000 per year from 1981.
- Total market potential would convert to \$10,350,000 in 1981 (690 installations at \$15,000 each) and \$16,350,000 in 1985 (1,090 installations at \$15,000 each).
- The computer software market is very product and price competitive. Given marketing and installation support costs, INPUT estimates that profits would not exceed 10% of revenues. GD's expected profits would then be \$83,000 in 1981 and \$413,000 in 1985.

D. RECOMMENDATIONS

- INPUT recommends that General Dynamics not enter the sophisticated job control software market for the reasons given in the above Revenues, Profits and Market Potential section (C.5) of this chapter.

VIII PRODUCT COMPARISON

VIII PRODUCT COMPARISON

A. COMPARISON CRITERIA

- This portion of the report compares the relative marketability of the products surveyed.
- Products are compared on the basis of:
 - Market size and growth.
 - Magnitude of both short-term (one to two years) and long-term (five years) revenue and profit potential.
 - Degree of competition.
 - Closeness of fit to GD's key strengths and strategic directions.
 - Kind of marketing needed.

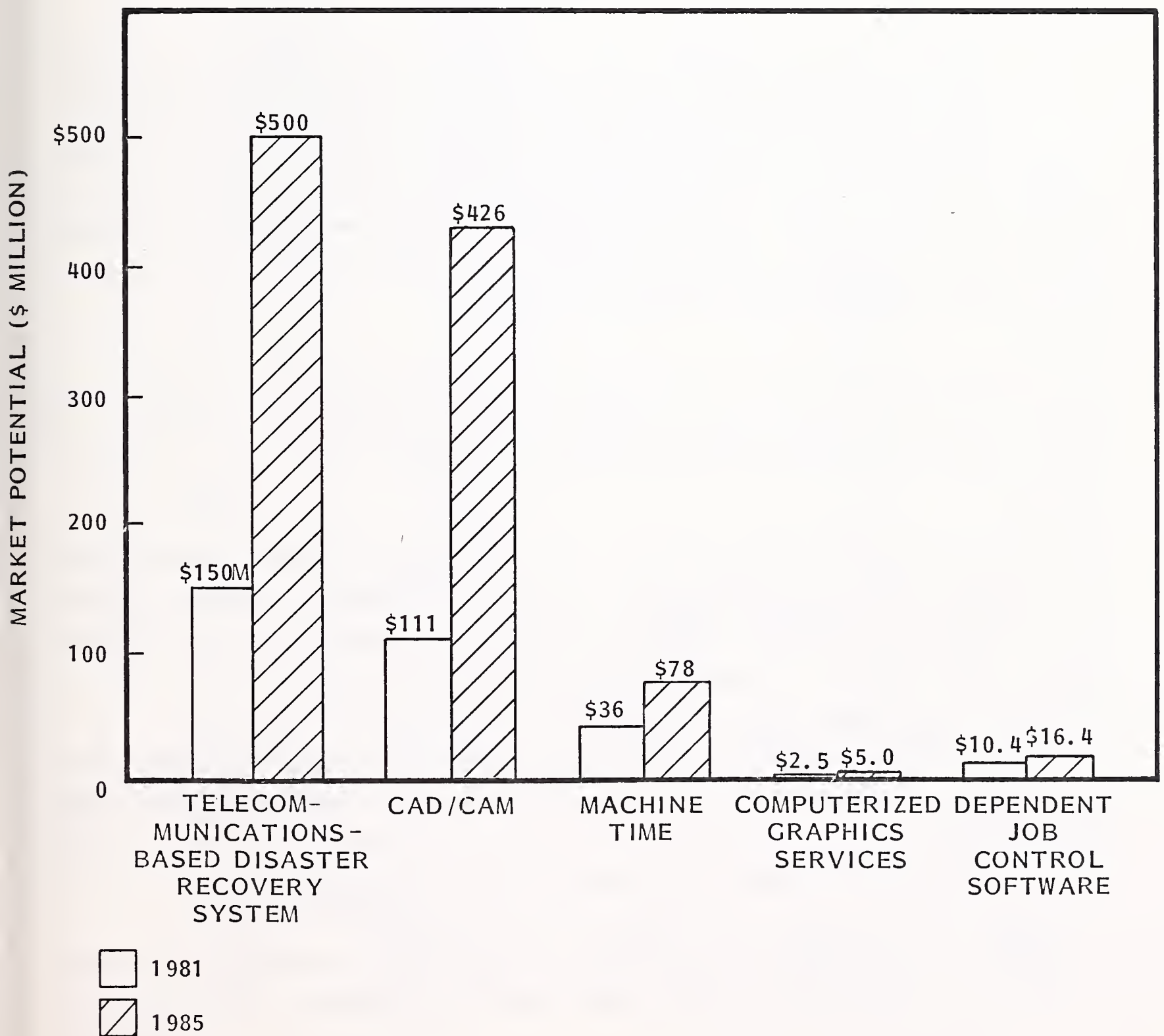
B. MARKET SIZE AND GROWTH

- Market size, growth and competition are extremely important when analyzing product opportunities.

- A market that is growing steadily may be unattractive, even if there is little competition. The cost of entering and maintaining operations may simply be too great to ever realize an adequate return.
 - Conversely, a market that is growing more slowly may offer excellent potential, even if there is some competition. The increasing demands of the market may outstrip the ability of all current suppliers to service it adequately.
 - It is not often that a viable market opportunity comes along that is appropriate for a company's capabilities and resources, and has not become a fierce battleground for market share and dominance. TBDRS represents one of these rare, ground-floor opportunities.
- Exhibit VIII-1 graphically illustrates the relative market potential for each product.
 - There is great variation between products.
 - The telecommunication-based disaster recovery program has the largest potential market revenue for 1981 and 1985, followed closely by CAD/CAM. Both of these represent national potentials.
 - Machine time and computerized graphics represent much less market potential because they represent regional market projections within 150 miles of Norwich.
 - Dependent job control, as a worldwide market, is second lowest in market potential for all five product areas. This is due to the relatively small number of prospective buyers of the package - estimated to be 25% of the 690 Univac 1100 installations world wide.

EXHIBIT VIII-1

COMPARATIVE MARKET POTENTIAL (1981, 1985)

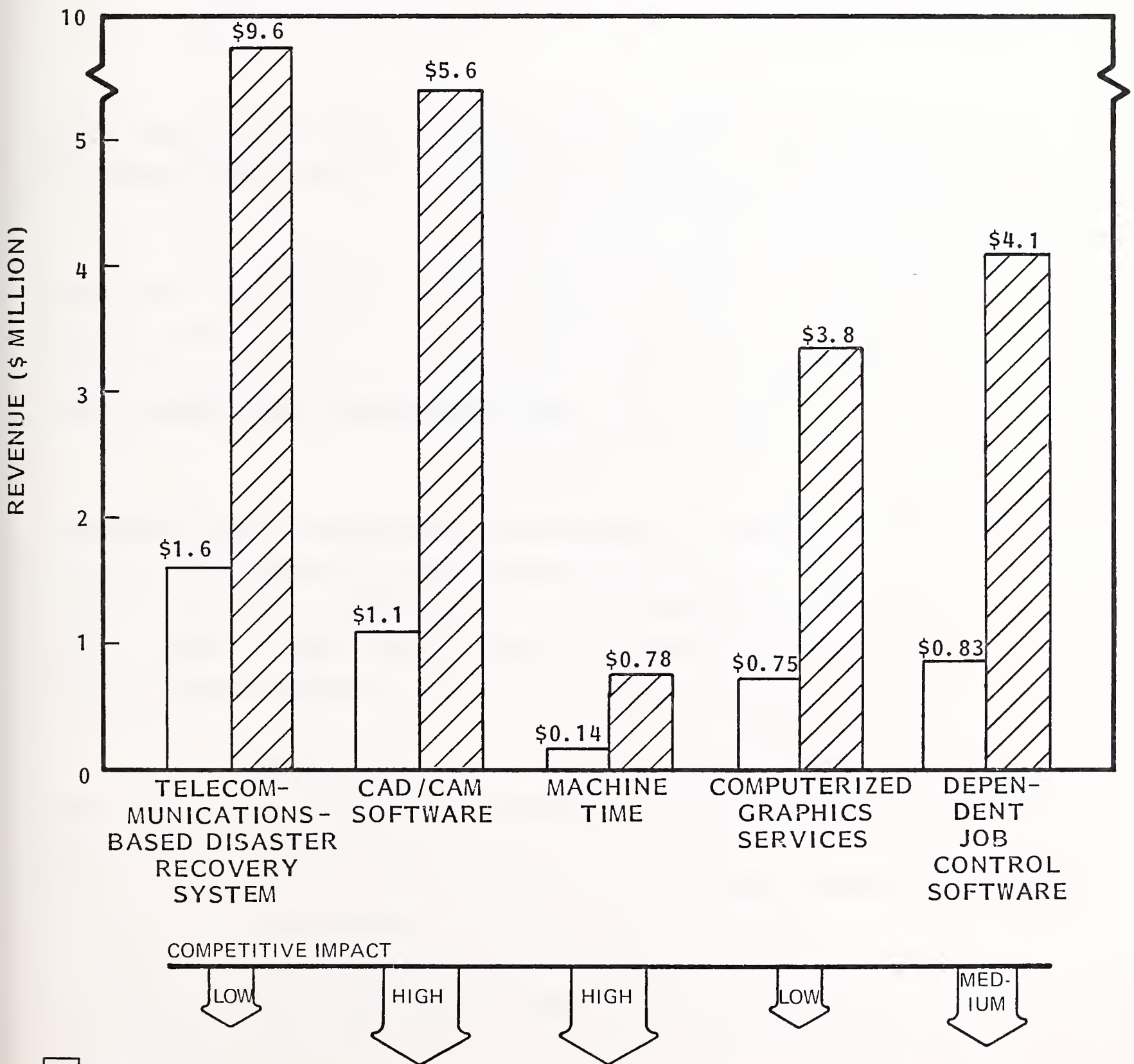


C. GD REVENUE OPPORTUNITY

- Exhibit VIII-2 shows INPUT's comparative estimates of GD's revenue opportunities. Also shown is a qualitative indication of the relative magnitudes of competition in each of these markets.
- TPDRC shows the greatest amount of GD revenues for 1981 (\$1.6 million) and 1985 (\$9.6 million) than any of the other products.
- These revenues are limited only by General Dynamics' ability to market its consulting services aggressively and to develop prototype backup systems for implementation in its clients' facilities. The 1981 projection is based on eight consulting projects in the first year of marketing and one project per month thereafter to 1985. System installations are assumed to begin in the second year of marketing; revenues therefrom (even though expected to be substantial) are not included in GD revenue projections.
- CAD/CAM shows the second largest GD revenue potential in a much more competitive market, with dependent job control software third. This is to be expected, since both markets are highly competitive.
- Computerized graphics represent a very small regional market. Demand is low and sporadic. Meaningful users buy their own systems; smaller users use outside services for overflow work which, in general, has quick turnaround requirements. As a result GD's revenues and profits would be small.
- Machine time represents a very competitive, well-established market where share of market does not come easily. Without some form of GD value added service in the form of special data bases or applications software, GD would not be able to establish a solid foothold in this declining market.
- The fastest-growing sector in the raw time market is state, local and federal government. This market will probably continue to suffer

EXHIBIT VIII-2

COMPARATIVE GENERAL DYNAMICS' PRODUCT REVENUES



1981
 1985

drastically from budget cuts, making competitive bidding and marginal pricing a certainty.

- As a result, GD's revenues are expected to be the lowest of all five proposed product areas.

D. COMPETITION

- The lower portion of Exhibit VIII-2 shows the relative degree of competition in each of these markets. Arrows are pointing downward to emphasize the potential negative impact on GD's revenue.
- TBDRC has a low degree of indirect competition from such companies as Sunguard and Iron Mountain. Major computer mainframe manufacturers and telephone companies currently act as advisors to their clients on computer backup possibilities, but their recommendations are usually limited to the respective segments of their business expertise.
- CAD/CAM software has stiff competition from the major system companies in this field, such as Computervision and Applicon. IBM and Lockheed also have teamed up to add significantly to the competitive environment by implementing CAD/CAM software on users' in-house IBM mainframes. Users themselves represent competition to the extent that they develop proprietary applications programs in-house.
- There are literally hundreds of remote computing services companies nationwide, with special and general applications to attract users to their system. For efficiency and convenience, a user will often choose a vendor for its special applications as well as its general machine time needs provided that the services are not prohibitively priced. The competitive picture would not be complete without mentioning the relatively large in-roads microcomputers are making into the remote computing business. With micros, clients have full

system use and control, 24 hours per day, at a cost usually substantially less than their annual timesharing bill. This trend is expected to continue in the foreseeable future.

- Even though there is very little competition for computerized graphics services, the absence of competition could be a sign of a barren market. Company in-house systems represent significant competition to an outside vendor, especially when proprietary information and special applications are involved.
- Competition in the DJC software market is both in-house and external. Users design some versions of their own software if needs are critical. They also have access to the Univac users' library and several commercial vendors that market various versions of DJC programs, which are adaptable (with some custom work) to the most discriminating client's needs.

E. ADDITIONAL CONSIDERATIONS

- Exhibit VIII-3 compares the products based on additional financial criteria, fit to GD's skills and market considerations.
- From a financial point of view, the five products in Exhibit VIII-3 fall into three categories:
 - TBDRC and CAD/CAM are in the top level. Their revenues and profits are almost double the next highest level.
 - CGS and DJC are in the second tier, with financial estimates four to five times greater than the remaining level.
 - The final product, machine time, is in the lowest level, with revenues and profits significantly lower than CGS and DJC.

EXHIBIT VIII-3

COMPARATIVE PRODUCT ANALYSIS

ROW	CRITERIA	TELECOMMUNI- CATIONS-BASED DISASTER RECOVERY SYSTEM	CAD/CAM	MACHINE TIME	COMPUTER- IZED GRAPHICS SERVICES	DEPENDENT JOB CONTROL
A	GENERAL DYNAMICS ANNUAL REVENUES (\$ THOUSAND) 1981 1985	\$1,600 9,600	\$1,100 5,600	\$144 780	\$ 750 3,750	\$ 825 4,125
B	GENERAL DYNAMICS ANNUAL PROFIT (\$ THOUSAND) 1981 1985	320 ⁽¹⁾ 1,920	110 ⁽²⁾ 560	14 ⁽²⁾ 70	75 ⁽²⁾ 375	83 ⁽²⁾ 413
C	FIT TO GENERAL DYNAMICS' STRATEGIC DIRECTIONS AND STRENGTHS ⁽³⁾	GOOD- VERY GOOD	GOOD	FAIR TO GOOD	FAIR	FAIR TO GOOD
D	OTHER CONSIDERATIONS	GREAT MARKET NEED	HIGHLY SATURATED MARKET (VENDOR)	VERY COM- PETITIVE	SHORT- TERM MARKET	VERY LIMITED MARKET

(1) AT 20% OF REVENUE

(2) AT 10% OF REVENUE

(3) AS A MANUFACTURER OF LOW-VOLUME, HIGH-TECHNOLOGY PRODUCTS, SKILLED IN COMPUTER-BASED TOOLS AND APPLICATIONS

- Regardless of which product(s) GD may select to pursue further, success in the computer software and services marketplace requires all of the following:
 - Commitment to the business on a full-time basis: Entering a new marketplace is too challenging to be considered a part-time job. To the customer, it must at all times look like a full-time, long-term commitment by the supplier. Internally, those responsible for making the business a success must be given full opportunity to make it happen.
 - Emphasis on marketing: All decisions regarding the strategies of planning the business must be made from the point of view of "what the market wants." Resources must be invested in personnel experienced in both marketing and selling computer services and/or system-type products.

APPENDIX A: INTERVIEW SUMMARY

APPENDIX A: INTERVIEW SUMMARY

- A total of 51 interviews were completed for this project (10 on-site and 41 telephone).
- Exhibit A-1 summarizes the number and type of interviews by product category.
- Respondents were informed that neither their name nor their firm's name would be identified with their replies. In addition, they were told that, in consideration of their participation in this survey, a special summary of the results would be sent to them.

EXHIBIT A-1

INTERVIEW SUMMARY -
EASTERN DATA CENTER

PRODUCT	TYPE OF INTERVIEW						
	MARKET PHONE	MARKET ON-SITE	TOTAL MARKET	VENDOR PHONE	VENDOR ON-SITE	TOTAL VENDOR	TOTAL ALL
COMPUTERIZED GRAPHICS SERVICES	5	2	7	3	0	3	10
MACHINE TIME	5	3	8	2	0	2	10
DEPENDENT JOB CONTROL SOFTWARE	9	0	9	1	0	1	10
TELECOMMUNI- CATIONS-BASED DISASTER RECOVERY PROGRAM	5	3	8	2	0	2	10
CAD/CAM	5	2	7	3	0	3	10
TOTAL	29	10	39	11	0	11	50

APPENDIX B: TELECOMMUNICATIONS-BASED DISASTER
RECOVERY SYSTEM (COMPUTER BACKUP)
QUESTIONNAIRE

COMPUTER BACK-UP USER QUESTIONNAIRE

INPUT is engaged in a study of computer back-up arrangements in medium and large computer installations. We would like to ask you several questions concerning your data center and its back-up arrangements. In return for your cooperation we will send you a summary of the report when it is completed. No respondent will be identified by name in the report.

- I. Please describe your hardware environment.

<u>MANUFACTURER</u>	<u>MODEL</u>	<u>NUMBER</u>
---------------------	--------------	---------------

CPU

Main Storage

Disk

Tape

Other (e.g.,
Mass Storage)

2. Please describe your communications environment.

Number of terminals _____ Line speed(s) _____

"Front-end" controller (IBM 3705, Memorex 1270, etc.)

TYPE

NUMBER

Access method (TCAM, VTAM, etc.) _____

Datalink control (SDLC, BISYNC, etc.) _____

3. Please describe your software environment.

Operating system and release

Data base management system.

Other important software packages

4. Critical applications and downtime. ("Critical" defined to mean essential to a firms daily operations.)

Description				
Critical Applications (List)	Batch On-Line	Computer Time/Week		Max. Downtime Before Serious Damage Occurs
		CPU	Elapsed	
Key Constraints On Recovery				
		CPU	Data Base	Commun-ications
				Other
				Comments

5. Critical applications consume approximately what percentage of applications.

Batch time _____

On-line time _____

TOTAL _____

6. Current back-up arrangements.

<u>Type Of Back-up</u>	<u>Back-up Site Name</u>	<u>Amount Paid</u>	<u>% Of Jobs Backed-up</u>	<u>Guaranteed Access?</u>	<u>Type & Amount Of Testing</u>	<u>Time Before Critical Applications Could Resume</u>		<u>Would Each Application Run Normally?</u>	<u>Comments</u>
						<u>1st</u>	<u>Last</u>		

Use another user's site

Co-op arrangements

Commercial computer time (Vendor or time sharing)

Disaster recovery service
 - Shell only
 - Hardware also

Rebuild installation (as the only back-up)
 - Same site
 - Nearby (under 1 mile)
 - New location

Other (describe)

None

7. What is your degree of satisfaction with present arrangements? 1 = Low 5 = High

Satisfaction

Awareness/Concern
Increasing At A
High Or Low Rate?

DP Management
Describe.

General Management
Describe.

- 8a. Do you have a formal disaster recovery plan? Describe.

- 8b. Have you performed a risk analysis of your back-up needs?

9. How far away should a back-up site ideally be?

Minimum Miles _____

Maximum Miles _____

10. What are your future plans for back-up arrangements? (e.g., type of back-up, percent of jobs backed-up, speed of recovery).

11. What outside sources have you had contact with concerning back-up? (consultants, hardware vendors, other vendors, seminars, etc.)
12. Who makes the decisions on what kind of back-up to use and resources to devote to it?
- 13a. What is the maximum amount you would be willing to pay for adequate back-up protection?
- \$_____ per year, and/or
- _____ % of budget
- 13b. Do you expect this amount to significantly increase?
14. What are your views on the general trends in this area over the next 5 years?

COMPUTER BACK-UP VENDOR QUESTIONNAIRE

1. Can you give me a description of the kinds of services you offer to computer installations needing back-up?

Services Offered	Number Of Customers	Charge Structure
Shell Sites		
Operational Sites		
Communications		
Full (Describe)		
Partial		
Software Conversion Capability		
Consulting		
Data Storage		
Other		

- 2a. What have your experiences been in actual back-up situations?

- 2b. Number and type of experiences in last year?
- 2c. How long did it take to restore operations? Were you on schedule?
- 2d. Were all applications restored? Was this as planned?
- 2e. What kind of problems were there?
- 2f. Do you offer any guarantees?
- 3a. What type of testing of procedures is currently performed?
- 3b. Do you have certain requirements/suggestions for testing?
- 3c. Are changes planned?
- 4a. Is user interest increasing? Why?

4b. What kind of resistance do users have in using your service?

4c. What types of users tend to use your service?

5. Describe the competition.

6a. What do you think future trends will be?

6b. Will this affect your offerings?

APPENDIX C: CAD/CAM QUESTIONNAIRE

CAD/CAM

USER QUESTIONNAIRE

1a. Are you currently using or planning to use ..

CAD? Yes () No ()

CAM? Yes () No ()

1b. If no to both, terminate the interview.

If yes, what CAD/CAM system(s) are you now using?

CAD

CAM

1c. Why did you choose these services over others?

1d. Are you happy with these products/service(s)?

Yes ()

No ()

Why?

- 1e. What product/service features do you like best/least from your current vendors of CAD/CAM services?

BEST

LEAST

- 1f. What product/service features would you like to see forth coming from these or other new vendors of CAD/CAM services?

- 1g. What is the most important criteria which you would use in making a decision to select a CAD/CAM vendor?

- 1h. Who makes the technical and administrative decisions in your company to purchase CAD/CAM services?

TITLE

Technical decision

Administrative decision

- 2a. Please list your primary applications for CAD/CAM services

CAD

CAM

- 2b. In what application areas do you foresee CAD/CAM being used in the next 2-5 years?

CAD

CAM

- 3a. Do you believe that CAD/CAM services are adequate for designing LSI/VLSI devices now and in the future?

Yes ()

No ()

Why?

- 3b. What changes do you believe would be necessary?

4. How much did your company spend on CAD/CAM services

in 1979? _____

in 1980? _____

- 5a. Please rate the importance of graphics in the applications listed below.
(1 = unimportant, 5 = extremely important.)

<u>APPLICATION</u>	<u>RATING</u>
Electronic Circuit Design and Simulation	_____
Manufacturing Plant Design	_____
Material Flow Diagrams	_____
Construction Site Plans	_____
Product Design Plans	_____
Personnel Training	_____

6. How would you rate the importance of the following product features for CAD/CAM applications? (1 = unimportant, 5 = extremely important.)

<u>FEATURE</u>	<u>RATING</u>
Modeling	_____
On-Line	_____
In-House	_____
Through Service Bureau	_____
Part Library	_____
Human Interaction	_____
State-of-the-Art Technology	_____
Industry Acceptance	_____
Academic Support	_____
Integration With Other Products	_____

7. Indicate your expectations from a CAD/CAM systems or services vendor for personnel training and product support by rating the following factors: (1 = unimportant, 5 = critical.)

- A. Maintenance of software by vendor field engineering organization through:

	<u>SYSTEMS VENDOR</u>	<u>SERVICES VENDOR</u>
- Personal visitation	_____	_____
- Remote diagnostics	_____	_____
- Periodic Enhancements	_____	_____
- Personnel Resident On-Site	_____	_____

- B. How much operator training do you think is required at the start of a program?

_____ Man days

8. If you were a new vendor of CAD/CAM services, what sales or marketing approach would you take to most interest prospective buyers of CAD/CAM services?
9. Would you be interested in working with a third party outside consulting organization (non vendor) to help you program and most effectively apply CAD/CAM techniques to your manufacturing and design operations?

Yes ()

No ()

10a. How would you prefer working with this consulting company?

10b. How much would you be willing to pay for these services?

- 11a. Would you be interested in accessing a CAD/CAM user library of a wide variety of software application programs which could be modified or used directly on your in-house systems?

Yes ()

No ()

- 11b. What would be the most effective and convenient mode of accessing such a library?
- 11c. How would you prefer to pay for this service?
12. What kind of other outside help would you like to have in implementing CAD/CAM services within your company?

CAD/CAM

VENDOR QUESTIONNAIRE

1. What type of CAD/CAM services you market?
- 2a. In what application areas do your customers use these services?
- 2b. How do you charge for these services?
- 3a. What size companies are now using these services?
- 3b. What percentage of your customer base are Fortune 1000 companies?
4. What is your annual sales revenues from these products/services
in 1979?
in 1980?

5. What do your clients like best/least about your services?

BEST

LEAST

6. Who is your biggest competitor for these products/services?

7. Why do companies choose your product/service over your competitors?

8. What future applications do you see in the marketplace for your CAD/CAM products/services in the next 5 years?

9a. What market/application areas have the greatest future sales potential?

9b. Why?

10. What is your estimate of total U.S. dollar sales for CAD/CAM services in 1985?

CAD _____

CAM _____

11. What factor do you consider to be most critical to successfully compete in this marketplace?

12. What new CAD/CAM products/services will be available to the marketplace in the next 5 years?

13a. Do you provide consulting and programming support to your CAD/CAM customers?

Yes ()

No ()

13b. What percentage of your revenues come from

Consulting _____

Programming _____

13c. Do your customers prefer to do their own custom programming and applications development for CAD/CAM?

Yes ()

No ()

Why?

13d. Would you be interested in working on an exclusive/non exclusive basis with a large company who can provide in depth consulting expertise to CAD/CAM end users in a wide variety of application areas?

Yes ()

No ()

13e. How would you envision developing such a working relationship?

14. What is the most difficult aspect of selling CAD/CAM services to a prospective customer?

APPENDIX D: MACHINE TIME QUESTIONNAIRE

MACHINE TIME USER QUESTIONNAIRE

INPUT is engaged in a study of computer utilization in medium and large computer installations. We would like to ask you several questions concerning your data center and its back-up arrangements. In return for your cooperation we will send you a summary of the report when it is completed. No respondent will be identified by name in our report.

I. Hardware environment.

<u>MANUFACTURER</u>	<u>MODEL</u>	<u>NUMBER</u>
---------------------	--------------	---------------

CPU		
-----	--	--

Main Storage		
--------------	--	--

Disk		
------	--	--

Tape		
------	--	--

Other (e.g., Mass Storage)		
-------------------------------	--	--

2. Communications environment.

Number of terminals _____ Line speed(s) _____

"Front-end" controller (IBM 3705, Memorex 1270, etc.)

TYPENUMBER

Access method (TCAM, VTAM, etc.) _____

Datalink control (SDLC, BISYNC, etc.) _____

3. Software environment.

Operating system and release

Data base management system.

Other important software packages

4. Operating environment.

Percent Batch

Percent On-Line

5. CPU Loading (%)

NOWTRENDS

Weekday

1st Shift (12 midnight - 8 a.m.)

2nd Shift

3rd Shift

Weekend

Average

6. What steps are you taking to:

Increase CPU efficiency?

Balance CPU loadings?

7a. In the past year have you used machine time from an outside organization?

YES () NO ()

7b. If yes, what reason?

7c.

Supplier Data	<u>Name</u>	Type of Organization (e.g., User, Machine Time Vendor)	<u>Distance</u>	<u>Cost</u>
------------------	-------------	--	-----------------	-------------

7d. Approximately how much did this cost? _____ hrs.
_____ SRU
\$ _____

7e. What type of data transmittal was used?

Courier _____ %

Remote batch _____ %

On-line _____ %

7f. Do you expect a change in these patterns in the coming year?

YES () NO ()

Explain.

7g. Who in your organization makes the ultimate decision on whether to use outside time and the price to be paid?

8a. In the past year have you supplied machine time to an outside organization?

YES () NO ()

8b. If yes, what reason?

8c.

Organization Data	<u>Name</u>	Type of Organization (e.g., User, Machine Time Vendor)	<u>Distance</u>	<u>Cost</u>
----------------------	-------------	--	-----------------	-------------

8d. Approximately how much was supplied? _____ hrs.
_____ SRU
\$ _____

8e. What type of transmittal was used?

Courier _____ %

Remote batch _____ %

On-line _____ %

8f. Do you expect a change in these patterns in the coming year?

YES () NO ()

Explain.

8g. Who in your organization makes the ultimate decision on whether to outside organizations and under what conditions?

MACHINE TIME VENDOR QUESTIONNAIRE

INPUT is engaged in a study of computer utilization in medium and large user installations. As one measure of this we are looking at the use of outside computer time by users.

We would like to ask you several questions involving your sales of computer time. In return for your cooperation we will send you a summary of the report when it is completed. If you consider any of the information you supply as proprietary, please make this known and we will treat it as such.

In any event no respondent will be identified by name in our report.

1. What kind of services do you offer?

Batch	_____
Remote-batch	_____
On-line	_____
Other	_____

2. What hardware do you use?

<u>MANUFACTURER</u>	<u>MODEL</u>	<u>NUMBER</u>
---------------------	--------------	---------------

CPU

Main Storage

Disk

Tape

Other (e.g.,
Mass Storage)

3a. What software do you routinely support?

3b. Will you add other software of customers require it?

4a. What is your general charge structure?

\$_____ per hour

\$_____ per SRU (define)

Other

4b. Do you have a standard price schedule?

YES () NO ()

Describe.

4c. Do you give discounts for large users?

YES () NO ()

Describe.

5. What is your usually market area? Has this been increasing?

- 6a. What was your level of activity last year? What change do you expect for the current year and next year?

CUSTOMERS

SALES (\$)

1979

1980

1981

7. How would you evaluate the following factors as affecting your business?

Other full time machine time vendors.

Users who sell time.

Falling mainframe prices.

Mini computers.

Overall economic situation.

Other.

8. What trends do you see in computer capacity and how do you see them affecting your business?

APPENDIX E: COMPUTERIZED GRAPHICS SERVICE
QUESTIONNAIRE

COMPUTERIZED GRAPHICS SERVICE
USER QUESTIONNAIRE

1. Does your company do design work which involves the creation of drawings and blueprints?

YES _____

NO _____ (If "NO", end interview)

2. Approximately how many design engineers and draftsmen does your company employ?

- 3a. Does the number of design engineers and draftsmen in your company fluctuate by 20% or more during a 12-month period?

YES _____

If "YES"

3b. What causes these fluctuations? _____

NO _____

4. Listed below are several characteristics of drawings and blueprints. Please indicate to what extent these characteristics apply to your company's drawings.

	<u>OFTEN</u>	<u>SOMETIMES</u>	<u>NEVER</u>	<u>DON'T KNOW</u>
a. Are drawn very close to scale	_____	_____	_____	_____
b. Include standard components	_____	_____	_____	_____
c. Are very complex	_____	_____	_____	_____
d. Are modifications to existing drawings	_____	_____	_____	_____
e. Require much hand lettering	_____	_____	_____	_____
f. Incorporate U.S. military standards	_____	_____	_____	_____

4. (continued)

	<u>OFTEN</u>	<u>SOMETIMES</u>	<u>NEVER</u>	<u>DON'T KNOW</u>
g. Produced in 3 dimensions	_____	_____	_____	_____
h. Other important characteristics (Specify)				
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

5. Approximately how many drawings does your company produce in an average 30-day period? _____

6. Is the number of drawings produced per month likely to increase or decrease in the next 12 months?

YES _____

If "YES"

6a. By what percentage?

% increase _____

% decrease _____

6b. What is the main cause of this change in volume? _____

NO _____

7. Are these drawings used as input to some other system or process?

YES _____

If "YES", give example of such systems or processes

NO _____

8. Are you familiar with computerized graphics systems which allow a designer or draftsman to produce drawings with the help of a computer?
- YES _____
- NO _____ (Read Definition, then go to Question #33.)
9. Has your company ever seriously considered the usage of such a system?
- YES _____ (When? _____)
- NO _____ (Go to Question #33.)
10. Is your company currently using a computerized graphics system?
- YES _____
- NO _____ (Go to Question #33.)
- 11a. Has your company leased or purchased the necessary hardware and software?
- YES _____
- If "YES", 11b. Who is the vendor(s)? _____
- 11c. What model? _____
- 11d. Approximate purchase price. _____
- 11e. How many systems do you have? _____
- 11f. What applications do you use it for? _____
- _____
- _____

11g. When did you first acquire the system(s)?

11h. Is your usage of this equipment increasing or decreasing? Why? _____

NO _____

12. Is your company using any computerized graphics systems on a service basis? (i.e., a vendor provides the usage of the equipment as a service to several customers)

YES _____

NO _____ (Go to Question #33.)

13. What applications and types of drawings are you using it for? _____

14. When did you first begin using this service? _____

15. Who is the vendor for this service? (Name and location) _____

16. What does the vendor supply with this service?

TERMINAL HARDWARE _____

HOST COMPUTER _____

PERSONNEL TO USE THE EQUIPMENT _____

TRAINING _____

CONSULTING (Specify functions performed) _____

OTHER (Specify) _____

17. Approximately what does your company spend per month to use this service?

18. What does this expenditure include? _____

19. How many drawings per month do you produce for this expenditure? _____

20. How is the service priced? _____

21. During 1980, is your company's usage of this service likely to increase or decrease?

YES _____

If "YES", specify expected percentage change over 1979

% Increase _____ or % Decrease _____

What factors will cause this change? _____

NO _____

22. What are the main benefits of this service to your company? _____

23. What types of vendor and/or internal problems have you encountered to date with the service? _____

24. Are you aware of any other vendors which offer computerized graphics services?
YES _____
If "YES", Who? (Name and Location) _____

- NO _____
25. What was the main reason your company elected to use your current service vendor rather than some other supplier? _____

26. How did your company justify the cost of such a service? _____

27. What objections or concerns were encountered from within your company prior to first usage of the service?

28. Who, by job title, evaluated the service? _____
29. Who, by job title, made the final decision to buy? _____
30. What additional capabilities would your company like to see in such a service, which are not currently offered? Why?

31. All things considered, how would you rate your company's satisfaction with the service?
- | | |
|-----------------------------|-------------------------|
| VERY SATISFIED _____ | VERY DISAPPOINTED _____ |
| SOMEWHAT SATISFIED _____ | DON'T KNOW _____ |
| SOMEWHAT DISAPPOINTED _____ | |

WHY? _____

32. When your current contract expires for this service, how likely is it that you will renew with your current vendor? Why?

(GO TO QUESTION #37.)

33. Vendors who provide computerized graphics claim to provide a number of benefits to their customers. Please rank the following benefits in terms of their appeal to the decision-makers within your company.

("1" = most important, "2" = next most important, etc.)

_____ Improves design personnel productivity by relieving them of drafting tasks.

_____ Speeds up turnaround of drawings.

_____ Provides high quality drawings at lower cost.

_____ Reduces severity of shortage of design personnel.

34. Are there any other benefits, not listed above, which such a system might provide to your company? Please specify.

INPU

- computerized graphic system?

- computerized graphic service?

NO INTEREST

38. Do you know of any other firms which use, or are considering the usage of a computerized design graphics service? (Name and Location)

39. Do you know of any vendors of computerized graphics services? (Name and Location)

COMPUTERIZED GRAPHICS SERVICE
VENDOR QUESTIONNAIRE

1. What type of computerized graphics services does your firm offer? (Hardware, support personnel, etc.)

2. How long have you been offering this service? _____

3. Why did you elect to begin offering this service? _____

4. What size and types of customers do you serve? _____

5. What types of drawings do they produce with your service? _____

6. What customers can you cite as references? (Name, location, person to contact)

7. How is your service priced? _____

8. Approximately how much would an average customer spend for your service/year?

9. What advantages does your service provide to a customer? _____

10. Why would a customer select your firm rather than a competitor? _____

11. What firms do you most often compete against? _____

12. What is your primary indirect competition? Why? _____

13. Approximately how many customers have used your service to date?

14. Approximately how much business did you do in computerized graphics services in 1979?

15. What percentage change do you anticipate for 1980? _____
16. What percentage growth (if any) do you anticipate over the next 5 years?

17. What are the primary forces contributing to this 5 year outlook? (Both positive and negative.) _____
- _____
- _____
- _____
- _____
- _____
- _____
18. What types of customers offer the greatest growth potential over the next several years? _____
- _____
- _____
- _____
- _____
- _____
- _____
19. What is the biggest challenge regarding the marketing of engineering graphics services? Why? _____
- _____
- _____
- _____
- _____
- _____
- _____

20. What types of objections do you most frequently hear? _____

21. Does your company use computerized graphics services for internal work?

YES _____

If "YES", what type of problems are encountered when you attempt to market a service for which you have internal needs? _____

NO _____

22. What other comments and observations would you like to make? _____

23. Do you know of any other firms which might be interested in participating in this survey? (Names and locations) _____

THANK YOU VERY MUCH FOR YOUR TIME

APPENDIX F: DEPENDENT JOB CONTROL SOFTWARE QUESTIONNAIRE

DEPENDENT JOB CONTROL

USER QUESTIONNAIRE

1. Do you have an automated job control system available on your Univac 1100 computer?

Yes ()

No ()

If not, go to questions 2 and 3.

If yes, go to questions 4 and 5.

- 2a. If not, would you be interested in purchasing such a program?

Yes ()

No ()

Why?

- 2b. Would the acquisition of these capabilities provide you with a significant improvement in the efficiency and effectiveness of your data processing operations?

Yes ()

No ()

How?

3. How much would you be willing to pay for such a software program?

4. Are you happy with the system you are now using?

Yes ()

No ()

Why?

5. Where did you obtain this program?

() Outside software vendor _____

() Developed in-house NAME

() Other (specify)

CONTINUE WITH QUESTION 6 TO END OF INTERVIEW

6. Do you use this program in conjunction with other support/utility programs?

Yes ()

No ()

If so, which ones?

7. What additional features would you like to have in your job control program?

8. What would be your primary considerations in evaluating the purchase of such a program offered by an outside vendor?

9. In your opinion, how large a market do you think exists for such a program?

COMMERCIAL PRODUCT OPPORTUNITIES

GENERAL DYNAMICS (EASTERN DATA SYSTEMS CENTER)

ABSTRACT

This report analyzes the commercial marketability of five data processing related products available from General Dynamics' Eastern Data Systems Center (EDSC) at Norwich, Connecticut.

Of the products investigated, telecommunication-based disaster recovery systems offer the most attractive market opportunity. Market demand is high and rapidly growing with relatively little competition at this time. The service best leverages GD's technological capabilities with short-term planning goals.

None of the other four product areas analyzed - CAD/CAM systems and software, dependent job control software, machine time and computerized graphic services - is recommended for marketing by GD. Although interest in these products varies, the overall market is either too small or too mature (and therefore too costly) to enter.

Regardless of which products General Dynamics chooses, two key factors must be kept in mind to be successful in today's highly competitive marketplace; they are: (1) commitment to the business on a full-time basis, and (2) strong emphasis on marketing.

